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ABSTRACT

Mathematics and the use of mathematical thinking should be much more than what has been traditional school arithmetic. Much of the mathematical reasoning can be developed and experienced out of school, particularly in the home. This material is a teacher's guide designed to help parents support what is done with their children in class. Background material for parents is provided. Some underlying principles for teaching mathematics meaningfully are listed. End-of-the-year assessment material is presented. A total of 44 activities on the following concepts and skills are included: (1) comparing; (2) sorting; (3) ordering; (4) working with patterns; (5) number concept; and (6) arithmetic operations. Songs and verses for kindergarten children are provided. (YP)

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# MEANINGFUL MATHEMATICS

## KINDERGARTEN

### TEACHER'S GUIDE
### TO
### LESSON PLANS

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TO: THE TEACHER

FROM: A. DEAN HENDRICKSON

Attached is something you can reproduce and send home to parents to encourage them to support what you are doing in the classroom.

# MATHEMATICS IN THE HOME

A. Dean Hendrickson, University of Minnesota-Duluth

## Introduction:

Mathematics and the use of mathematical thinking is much more than what has been traditional school arithmetic. The arithmetic of whole numbers, fractions and decimals constitutes no more than 10-15% of the mathematics we use throughout our lives. Much of the mathematical reasoning we use can be developed and experienced out of school, particularly in the home. Some of these suggestions may seem remote from the arithmetic you remember, but they will involve children in the THINKING essential to both the learning and use of mathematics in everyday life.

## Pre-Mathematical Thinking:

Before a child can understand school mathematics, certain ways of thinking and skills must be available for use. These are continuously used throughout learning of mathematics, but particularly elementary school mathematics. These include: counting, comparing, ordering, using patterns, using grouped material, using language and establishing relations and relationships. Needed experience with these can be obtained around the home. Before describing things to do with children at home to help them with their school mathematics, here are some "golden rules" based upon research and experience with learning children.

1. You must not force children since this has negative effects, such as turning them away from doing things or from you. A child learns when ready, curious, and needing to make sense of something. This goes in spades for drill on memorizing so-called "basic facts."

2. Give children positive things to do when time is available, especially those things they can do and enjoy doing. Don't ask for things beyond the child's capacity to do.

3. Give lots of praise and encouragement. If what the child does or says doesn't seem to make sense to you, don't criticize or correct. Ask questions that might lead the child to consider it in a different way.

4. Don't look for day-to-day progress or change or for immediate results. Just as with many other things, such as walking or talking, a child may seem to be making no headway and then suddenly, it's all there. Children develop in spurts and unevenly, and have long plateaus where nothing seems to be happening. That's normal and accept it. There is probably a lot going on below the surface.

5. Don't compare yours with other children. Everyone is different - thank goodness!

6. Don't worry if a particular skill, such as using language, is

coming along more slowly than you'd like or than brother John's did. Somehow most of them seem quite a lot alike by the time they are 12 or so.

## Words:

A number of words commonly used in mathematics and related to teaching mathematics should be used often outside of school as well. Some examples are *some-more, a lot, more than, less than, large, small, many, few, same as, different, alike, all, some, not, left, right, ahead of, behind, above, below, front, back, long, short.*

In addition to words associated with comparing, grouping and space, the number words are important. Children must know the counting words, but even more than that, they must see the pattern in the use of counting words. The cordial words like *first, second, third,* et. are also important. Use of these words around home helps children to count objects correctly and to identify position of things in ordered arrangements.

## Comparing:

Have children compare things as to size, length, are and volume whenever possible. "Which glass has more?" "Which box holds more?" "which of these is heavier? heaviest?" "Put these sticks in order of length." "Arrange the silverware so the longest is farthest from the plate and the shortest is nearest the plate." Questions like these should be frequent. They should involve different kinds of things both indoors and outdoors. Combine these with questions that make the children estimate measurements of distance and height such as "Which do you think is as high as the shed, A or B?"

Comparing of quantity leads to better understanding of number and number relationships. "Are there more chairs or lamps in this room?" "Are there more cups or teaspoons on the table?" "Have we go more red roofs or green roofs on our street?" "Put enough table knives on the table so that there are as many knives as forks." "Do you have more boys or girls in your class?" These can be asked when out walking, riding in the car, watching TV or sitting in the boat. Ask children to do things that will make one group as large as another frequently All such activity helps children build number relations into their deeper understandings, instead of as memorized associations that have no meaning - like names and dates you once memorized to pass a history test!

Ordering things that can be counted is important. Bead stringing activities are good for young children. "String some beads so the third bead is red and the fourth bead is blue." "Make a string so every other one is green," etc.

Ordering things that have lengths, areas and volumes extends comparing beyond two things. Have children place three sticks of different lengths in order from shortest to longest; place three pieces of paper of different areas into orders; place three different sized cans of jars into order. Gradually extend the number of things to more than three for these activities.

Ask frequent questions about the ordering of events as to which happens first, second...last, etc. Connect these with time estimations, "How many minutes ago do you think this happened? How many days?" etc.

## Counting:

Children should keep extending their memorized sequence of counting words. This is important. But being able to say the words in right order does not mean they can count things. They need much practice at this. Have them count everything around the house that is countable - the chairs, tables, legs on chairs; the tiles on the floor, in the ceiling; the number of windows in a room; the silverware in the drawer; the cans on the shelf; the pieces of wood in the woodpile; the telephone poles going by, etc. The more they count, the better able they are to count. When they are pretty good at counting forward, have them do some counting back. For example, start with 20 clothespins. One at at time put one into a can and count aloud those that are left as each one is removed from the pile.

## Patterns:

Have children look for patterns - in the carpet, in the ceiling, in wallpaper, in the drapes, on the bedspreads. Patterns of shape, or color, or sound are all important. Beads can be strung in patterns. Collections of bottle caps, old keys, buttons, screws, nuts and bolts, and similar "junk" can be put into patterns. Ask children what would come next in a pattern, or what would go where something is missing in a pattern.

## Number:

Help your child learn number size by having him see the same number, such as five, in many different arrangements and materials. Playing cards can be sorted into those all having the same number. Mixed groups of say, five marbles, three buttons, three keys, six spoons, can be used. "Find me the material there are five of," etc. Put some number, seven for example, of beads or marbles into three or four different shaped glass jars, "Find a jar with seven in it." "Find another." Put the same number of one kind of thing in one jar and another kind in a second jar, etc., and do the same kind of thing. Involve the child with numbers in as many different ways, with as many different kinds of material, and as many different sizes as possible. Gradually increase the number size as the child seems able to easily handle smaller numbers.

## Using Numbers:

Comparing groups with number property; combining such groups; separating larger groups into smaller groups of a given size or into equal size groups - all of these activities help children to understand when each of the four arithmetic operations are used.

Some examples of things to do in the home of this kind are:

1. Compare two different sized groups in several ways. "How many more are there in this group than in that group?" "This group has how many fewer than that group?" "How many times as many are there here as there?" These kinds of questions used with groups of all kinds

of things - knives, forks, chairs, chair legs and table legs, buttons, marbles, pieces of candy, etc., help the child with what the school is doing.

2. Join together several groups of the same size into a larger group. Rows of pennies can be arranged into an array like this and can then be looked at a different way to see 5 groups of 6 pennies: ●●●●●●
●●●●●●
●●●●●●
●●●●●●
●●●●●●

   Both lead to a total of 30 in the array. Do this in a row at a time, having the child tell you how many are there all together each time. Separate and take apart such arrays row by row and see what is left each time. Do this with different kinds of things, different size rows and different total numbers of things. Clothes pins, ceramic tiles, beans, corn are all good for this.

3. Join together groups of different size, such as seven things with five things. Have the child describe what is happening in words. Have the child add to one group of things enough to make it the same size as another larger group. Have the child make equal two unequal size groups without adding anything more to the collection. "Here are a group of 15 clothes pins and one of 7 clothes pins. Do something so you have two equal groups."

4. Give the child large amounts - in the 20's or 30's of things to:

   a) make several groups of a given size from. Some numbers should make these smaller groups an even number of times and some should have some left that is not enough to make another of the smaller group.

   b) make a certain number of groups that will all have just as many in them.

   Examples:

   "Put these 30 beans into 6 cups, so each cup has just as many. How many are in each cu?"

   "Put these 43 beans, six at a time into cups. How many cups did you use?" "What should e done with what is left over?" "When do you have some left over?" "When don't you have anything left over?"

When you do for walks, have the children compare, add together, etc., things along the way. Do the same in the car, the supermarket, in the drugstore. "How many are there on the top shelf?" "How many re on the bottom shelf?" "How many are there on the top and bottom shelves together?"

Have the child do as much adding, subtracting, multiplying and dividing of this kind - always as related to things - as you can. DON'T try to drill your child on "addition" facts or "multiplication" facts. Let the child learn these in due time through the school activities and those you do at home as described here. DON'T have the child write number things - the school will do this. Accept verbal answers and descriptions. Get in the habit of asking your child why certain answers are given and LISTEN.

SOME FINAL HINTS:

1. Have your children count things as much as possible.
2. Ask children simple addition, subtraction questions about REAL things in the surroundings to give practice in mental arithmetic.
3. Play card games that require mathematics or related things like WAR, OLD MAID, CRIBBAGE, RUMMY (regular or gin).
4. Give thinking games for holiday gifts - CONCENTRATION, HUSKER DU, etc.
5. Get a Little Professor or some similar calculator-based program to give mental arithmetic practice.
6. Cheap mathematics games can be bought at Target, Woolworths, etc. Some examples are COVER UP, HEADS UP, SCORE FOUR, TUF, APOLLO, etc.
7. Give your child a simple four function calculator and let him or her fool around with it.
8. Encourage block play and building, sand play, making birdhouses, etc.
9. Key words are COMPARING, COUNTING, PATTERNS, COMBINING (groups), SEPARATING (large groups into smaller groups)
10. Point out mathematics wherever it is in the surroundings. Children must realize mathematics is:
    - a. easy to learn
    - b. useful
    - c. fun

# MEANINGFUL MATHEMATICS
# TEACHER'S GUIDE FOR KINDERGARTEN

## INTRODUCTION

Mathematical activities in kindergarten should be primarily in the areas of comparing, sorting and classifying, working with patterns, and counting and number concept activities. These should use whatever materials are available that can be compared, sorted, patterned, grouped, and counted - such as buttons, bottle caps, plastic tableware, toy cars and animal shapes, etc. Some selected commercial materials are needed for some lessons.

### COMPARING

Comparisons of a variety of physical properties should be made - lengths; quantity; weight; size; areas; volumes; colors; shapes; textures of materials such as wood, foam, plastic and metal; distances; and locations in space. Language to be developed should include comparative pairs or triples like the following: longer/shorter; heavier/lighter; more/same/less; higher/lower; nearer/farther; smoother/rougher; above/below; left/right; faster/slower; larger/smaller; inside/outside; on/off; light/dark; same/different; hard/soft; thicker/thinner; sink/float.

Comparison serves as the basis for classification, so **same/different** activities involving properties that might determine whether things belong together or are not imporant. **"How are these alike?" - "How are these different?"** should be frequent questions to get children to verbalize their recognitions. However, such verbalization should not be demanded if the children do not seem ready for it. ***Observing*** how they handle the sorting or grouping is as valid an indication of understanding as judging correctness of verbalizing.

## CLASSIFICATION

Classification involves putting things together that belong together because they are alike in some way(s). These might be physical properties, uses, or relationships. Initial separation of things into disjoint classes is based on striking perceptual differnces such as color, shape, size or texture. The first activities should involve putting the red things together, the squares together, smooth shells together, etc.

Children of this age are unlikely to use multiple classification, or recognition of membership in two or more classes simultaneously, very successfully; nor are they likely to recognize class inclusion relationships, such as seeing that all dogs are animals, but some animals are not dogs. They are not likely to use ***not*** very successfully, as ***not*** identifies the complementary class not having a property or satisfying a condition. Nevertheless, activities with materials involving these classification concepts should be occasionally tried so children who are developing faster have an opportunity to see these relationships that they **ARE** capable of recognizing at that stage of development.

Materials suited for classification activities include colored shapes of different sizes and/or thicknesses; a variety of household and school articles such as the plastic cafeteria tableware; buttons; rocks; shells; clothes pins; nails; nuts; bolts; screws; dowel pieces; washers; scraps of fabric; old keys; scraps of wall paper; beans; peas; seeds; cans; boxes; bottle caps; clothing items; the children's characteristics such as hair color; scraps of metal; and scraps of wood.

Shoe boxes, egg cartons, string loops, and hula hoops can be used in classifying as locations for those things that are alike in some way and belong together, particularly when multiple classification or class inclusion lessons are tried.

## COUNTING

Children of this age should have experience with both oral counting to establish the counting word sequences, and rational counting, or counting of objects. In counting ***things*** like buttons and cubes, they usually show systematic ways of keeping track of the things already counted. These might include moving them in a line, into a container or into a separate group. They should touch and move objects as they count them for as long as they have to before silent counting can be expected; so children of this age should not generally be expected to do silent counting of objects. Establishing a 1-1 correspondence between counting words and objects is essential for most later work in mathematics, so rational counting should be of emphasis in kindergarten.

## NUMBER CONCEPT

Few children of this age can be expected to have even a partially developed concept of number, let alone a full concept, for numbers other than two or three.

To aid in the development of number concept, children must have many activities that involve a 1-1 correspondence between one collection of objects and another. They must also have the opportunity to group the objects in a collection in various ways, to rearrange the objects in a collection into groups of a given smaller size, and to see ***numberness*** in groups of different kinds of materials. An example is the ***threeness*** of a set of three cubes, a set of three chairs and a set of three children.

Along with the development of number concept must come the ability to write numerals. This is as important as the ability to recongize numerals since, in connecting mathematical signs to concepts, the proper sequence is for children to generate ***symbolic forms*** before being asked to interpret these forms as already written. The ability to write numerals is best developed by starting with large motor movements. If numerals are printed on large cards of a size about 18" x 24" that are on the wall, children can stand a distance away and move their arms to outline the shape of the numeral. Gradually move them closer, a little at a time, each time abbreviating the movement more, until at last they are tracing the numeral on the card with their fingers. The usual practice of the tracing of sandpaper numerals and tracing into wet sand can then follow. Individual lap chalkboards are ideal for having children begin their writing of numerals on a surface. Writing on paper should begin with dot patterns of numerals and other standard ways to develop this motor skill.

## PATTERNS

Work with patterns is another important pre-mathematical activity. Children should create patterns, recognize patterns, compare patterns, duplicate patterns, continue patterns, translate patterns from one medium to another, reverse patterns and re-order patterns. Many of these activities can be done with kindergarten children, but the emphasis should be on the first three patterning activities.

Suitable materials include Pattern Blocks, Unifix Cubes or Multilink Cubes, colored beads of different colors, shapes and sizes and cord to string these, Geoboards, Cuisenaire Rods, and fabric and wallpaper patterns. Colored materials with holes can be placed into patterns on shoelaces and on thin rods. The patterns found on the soles of "running" shoes are a good source of ideas found in every classroom. So are the clothing patterns found on what the children wear.

**FINALLY,** activities from these major areas should be interspersed throughout the year. Sequence is of no significance, except in numeral writing. All of them can be used to simultaneously develop language use, body use, rhythm use, and to help meet the social development goals that kindergarten teachers have.

In using concrete materials, it is **ALWAYS** advisable to permit young children time to explore the nature of these materials on their own - with no externally imposed directions. Children must answer the questions that come to them about such materials before they are ready to answer questions posed by others.

## KINDERGARTEN AND LEVEL ONF

## SOME UNDERLYING PRINCIPLES IN TEACHING MATHEMATICS MEANINGFULLY

1. Keep a proper balance between teaching and the fostering of spontaneous growth.
    a. Provide the environment
    b. Respond to the children's interests
    c. Don't intervene too much
    d. Remember that children learn most, if not all, things in THEIR OWN WAY.

2. Get acquainted with children's intellectual life.
    a. Play is children's work
    b. Find out what they are trying to understand
    c. Be sensitive to their errors - they usually correct themselves
    d. Remember that their arithmetic may be different from yours

3. Make available to children a stimulating enviroment.
    a. Use the natural environment as much as possible
    b. Remember that things and events are not stimulating in themselves, only to the extent that they meet children's needs and intellectual concerns

4. Trust and support children's intellectual work.
    a. They are continually learning - find out what
    b. Permit children to think - encourage it

5. Give special support to children's counting.
    a. This is the area in which you are likely to do the most good
    b. Help them memorize counting words
    c. Help them see the rules for forming words for

    larger numbers
    d. Have them count objects in a variety of ways - touching, moving, one at a time, by two's, by three's, etc.
    e. Give them simple addition, subtraction, multiplication, and division activities with real objects

6. Don't try to teach little children the terminology of "new math."

7. Avoid too much formal training, especially directed verbal instruction.

8. Don't bother with "readiness" activities.

    a. Children already know much
    b. Children's don't need to be made ready for math - they are. Engage them in it!

9. Don't waste time trying to train conservation behavior.

    a. It doesn't work
    b. Children learn to conserve in due course

10. Keep in mind the child's tremendous accomplishments.

    a. They already know much of what some programs are trying to "teach"
    b. Don't focus on weaknesses
    c. Mathematicis is easy to learn - engage them in the thinking that underlies mathematics concept formation

## WHAT TYPE OF ENVIRONMENT SHOULD THERE BE IN THE CLASSROOM SO THAT IT IS CONDUCIVE TO THE LEARNING PROCESS?

1. Children should be able to freely interact with their peers.
    a. Only through this interaction will the child be able to take all the different concepts and make these into one coherent whole.

2. Children should have the freedom to discover for themselves.
   a. How else could children develop THEIR OWN cognitive world unless they are allowed to act on objects and discover relationships between these objects?
   b. If a child is allowed to discover, through proper guidance from the teacher, lasting learning experiences result.

3. Children should be provided with activities that stimulate logico-mathematical reasoning.
   a. The children should have countless experiences that provide them with the opportunity to develop their own logic and reasoning powers.
   b. Every child should be encouraged to look to themselves for the correct answer, and this can come about only if they have frequent successes.

4. Children need individualized activities so that they can think and reason without outside interference.
   a. Opportunities should be made available for each child to work alone during some part of each day
   b. They should be presented with enough challenges to promote their intellectual development.

5. It is very difficult to differentiate between work and play when a child is acting on objects.
   a. Once a child knows that knowledge lasts forever; then and only then is lasting learning taking place

6. You, as a teacher, should be ever aware of how children learn.
   a. Children are continually taking in sensation, nourishment, ideas, and all sorts of information from the physical world. This taking-in process was called "assimilation" by Piaget. This assimilation is continuously balanced by "accommodation," which is the adjusting process of reaching out to the environment. These two processes function simultaneously at all biological and intellectual levels in both physical and intellectual development.
   b. A child is continually seeking to find a balance between the taking-in process and the adjusting process. This

interplay between these two functions was labeled as "equilibration" by Piaget. A child's mind seeks equilibrium between what he understands and what he experiences in his environment.

7. The teacher must teach each child to be able to function independently without supervision.

8. The classroom atmosphere should be such that there is a continual interaction between student and teacher, student and peers, student and environment.
    a. The teacher should talk TO the children and not AT the children
        1. This is so important - love and compassion for the children changes the whole classroom atmosphere completely
    b. Be yourself and make your mistakes with the children

9. Children should be allowed to make mistakes, for only through their mistakes does lasting learning take place.
    a. Never tell a child that he has the wrong answer. Ask questions so that you lead the child to discover a better answer for himself.
        1. If a child continually gives an answer that isn't the generally accepted one, then you, the teacher, should provide those kinds of activities that will eventually lead the child to see the error in his previous logic.

10. Every child should have a wide variety of experiences dealing with the same concept.
    a. Children should have many different experiences that deal with a given concept so that they expand their imagery of the concept.
    b. Children are constantly drawing on these past experiences and accommodating them to fit into their new experiences.
    c. Many of the experiences should be repeated over several times so that a child internalizes a concept. They know because it's in the constructed knowledge structure, not in short term rote memory.

## KINDERGARTEN

### FREE EXPLORATION

The recommended materials for use in kindergarten are:

UNIFIX CUBES
PATTERN BLOCKS
GEOBLOCKS
Counting materials: chips, buttons, etc.
Ordering materials: different size cubes, cylinders, sticks and other lengths, squares, circles, triangles, etc.
Classifiable materials: "junk" such as old keys, bottle caps, pieces of wood, cloth, metal
Sand, water, coloring
Eggtimers
Large attribute blocks (ASCDBLOCS)
Cards with numerals on them

Children should have the opportunity to answer all of their own questions about these materials before any "formal" lessons are conducted with them.

Children can each be given a small quantity of some material and observed as to what is done with them. Small groups can be given a pail of Pattern Blocks, several Unifix Cubes, 15-20 of the larger Geoblocks, etc. and observed. They should have time to play with these, explore what can be done with them and use them to answer questions about the relationships that exist. Keep reminding them that these are learning materials and should be taken care of. They should learn where they are kept and be able to take them and use them when they have free time, and return them to where they belong after using them. They must learn a few simple rules:

1. You never mess with something created by someone else
2. You never throw any material

Clues of what to suggest relative to the formal lessons can be obtained by observing the children's free exploration. You will learn which are ready for the different levels of counting, ordering, sorting, etc.

The "treasure chests" of non-commercial items should be put together at the beginning of the year, one for each child. They should be encouraged to explore these whenever they have free time.

Free exploration should be given periodically throughout the year - even after formal lessons are done with the materials.

## KINDERGARTEN

A suggested end-of-the-year assessment of children's development in selected areas.

Protocols

1. If individually administered concrete objects can be placed before children and oral instructions given.

2. If group administered, children can mark papers with pictures of materials, but oral instructions should be given to them.

Patterns

1. Linear continuation

Shapes in a pattern, add next two items that fit.

Example:

□ □ ○ □ □ ○ □ ___ ___

□ ○ △ □ ○ △ □ ○ — —

2. Translation

Letters in a pattern, find another with the same pattern and circle.

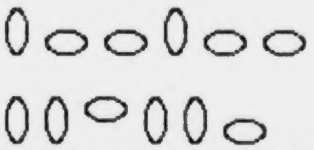
Example:

△ ○ ○ △ ○ ○ △ ○ ○

or

△ ○ △ ○ △ ○ △ ○

A B B A B B A B B or



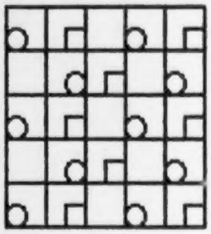
etc.

3. 2 dimensional patterns. Give a pattern, complete it:

| | | | | | |
|---|---|---|---|---|---|
| x | | x | | x | |
| | x | | x | | x |
| x | | x | | x | |
| | | | | | |
| | | | | | |
| | | | | | |

Put x's in boxes in last 3 rows to finish it.

Given a pattern, translate it. Put letters A and B in boxes in same pattern as shapes in given chart:



| | | | | |
|---|---|---|---|---|
| A | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

4. Pick out the pattern that is different from the others:

ABABABAB

□ △ □ △ □ △ □ △

| — | — | — | —

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V Λ V Λ V Λ V Λ

Pick out the two patterns that are alike:

ABBABBABB

□ △ ○ □ △ ○ □ △ ○

| - - - | - - - | - - -

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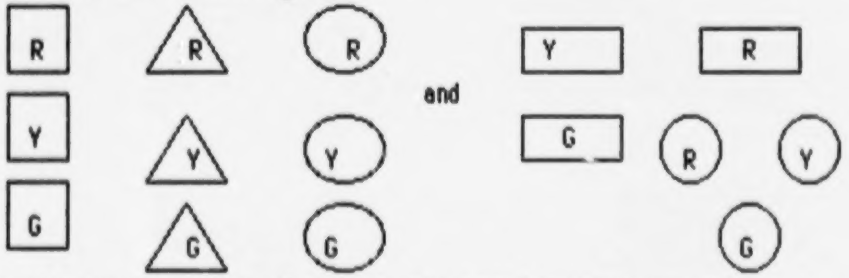
V Λ Λ V Λ Λ V Λ Λ

Classifying

1. Give different shapes of different colors and have these sorted.

2. Use cards with pictures of animals, tools, clothing on them and classify these.

3. Give the following:



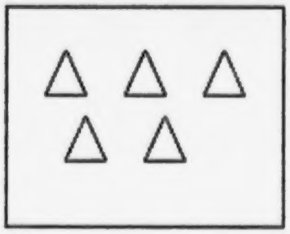
and have the child select correct one for the "corner."

Number

1. Give cards with number words and numerals on them and have the children match them:

FIVE 5

2. Give cards with objects on them and either or both numeral cards and word cards and have children match them:



3. Give graphs and have children select "Most" and "Least."

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| D | D | D | | | | | | | |
| C | C | C | C | C | C | | | | |
| B | B | B | B | | | | | | |
| A | A | A | A | A | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| △ | △ | △ | △ | △ | △ | | | | |
| ○ | ○ | ○ | ○ | | | | | | |
| □ | □ | □ | □ | □ | □ | □ | □ | | |
| ▭ | ▭ | | | | | | | | |

Counting
Oral: Have children count starting from "one."

Rational: Have children count as big a collection of objects from a larger collection as they can,i.e., 50 UNIFIX cubes, "Count out as big a group of cubes as you can count."

# KINDERGARTEN REPORT CARD

This is a report of the development of ______________________________ in the areas of cognitive growth and understanding of pre-mathematical and mathematical concepts.

COUNTING:
Knows the counting words in sequence through ____________________
Can count objects up to _____________ in number

COMPARING:
Uses the following comparative language correctly:
bigger-smaller    higher-lower    ahead of-behind    above-below
longer-shorter    left-right    darker-lighter    more-less

CLASSIFYING:
Can sort objects using one property
Can sort objects using the common presence of two properties
Can sort objects using the common presence of more than two properties

ORDERING:
Can order three objects according to: number    size    length
area (of similar shapes)    volume
Can order more than three objects according to _________    _________
_________    _________    _________

PATTERNS:
Can copy patterns
Can complete patterns
Can extend patterns
Can transfer patterns from one medium to another (such as a color pattern to a shape pattern)

NUMBER:
Knows the properties of numbers up to ____________
Identifies groups of equal number size
Separates a larger group into smaller groups of a given number size
Adds onto a given group to make a group of a required number size
Subtracts from a group to make a smaller group of a given number size
Can write the numerals

# KINDERGARTEN

## PROPERTIES OF THINGS

Introduction: Hold up some familiar object such as a box, a stuffed toy, etc. Ask the children to tell you what this is like: "What about this do you notice?" Keep probing for additional properties to identify. Ask leading questions like "How tall (or high) is it?" or "Does it have corners?" if you have to. Pick up on terms the children use to elaborate, explain, discuss, and clarify terminology and common physical properties that can be used to classify and order things.

Ask questions about use and function as well as physical properties.

Extensions:

1. Put a set of 3 or 4 different objects such as geometric shapes from Pattern Blocks or Attribute Blocks, plastic tableware, plastic animals, etc. in several bags. Give the children one of 2 or 3 different bags made up like this. Hold up an object contained in one of the bags. Ask the children to try to "feel" and find that object in the bag they have.

2. "What's My Rule?" Hold up an object from a set that the children have used frequently. Ask them "What's my rule for selecting this?" Possible responses, "It is red"; "It is square"; "It has three sides", etc.

3. Select a shape to be found on some object in the room, ie., "I spy a square." Have the children try to identify the object you are thinking of.

# KINDERGARTEN

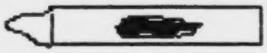
## SIMILARITIES AND DIFFERENCES 1: ALIKE

MATERIALS TO USE: Collectables such as lids, buttons, bottle caps, pine cones, shells, stuffed animals, plastic animals and toys, old keys, nuts, nails, odd nuts and bolts, all sizes of pencils, straws, rocks, pasta shells, beans.

PURPOSE: This lesson is to emphasize the idea of "alike" in preparation for classifying activities. It also gives children opportunity to identify several properties in which objects might be alike or different.

Introduction: Hold up a pencil and crayon for the children to see.

Pencil



Crayon

Ask them how these are alike. Write "alike" as a heading on the chalkboard and list the ways the children suggest these are alike. Be sure to orally repeat after the children and as you write on the board. Some ways might include, "They are both for writing"; "They are both long"; "They are both round"; "They are both red." Discuss all responses.

LESSON: Give groups of 3 children each a set of two objects. Ask them to discuss the objects and find all the ways that they are alike. Have each group in turn show their objects to the rest of the children and describe how they concluded the objects were "alike".

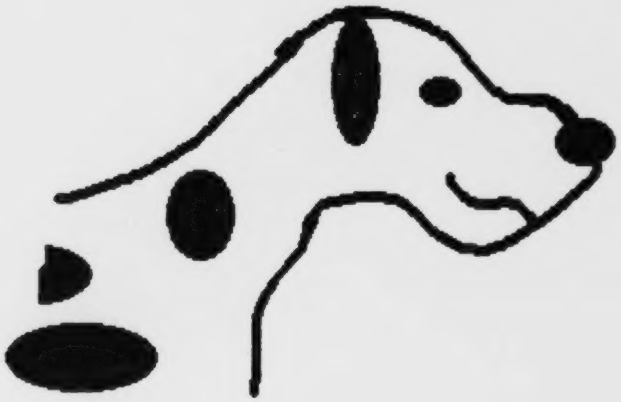
Extensions: Repeat this lesson emphasizing "alike" frequently with different pairs of objects. Extend this to three objects and/or four objects as children show ability to recognize "likeness".

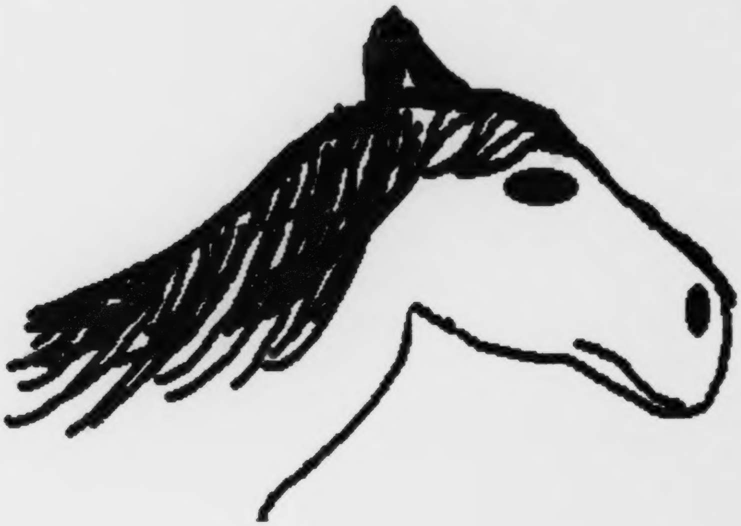
KINDERGARTEN

## SIMILARITIES AND DIFFERENCES 2: DIFFERENT

MATERIALS TO USE: Any objects alike in some ways, different in others as in Similarities and Differences (Alike).

Introduction: As with examining how things are alike, hold up a pair of objects and ask the children how these are DIFFERENT.





They may be different in physical properties such as shape, color, length, size, etc. or in uses or functions. Discuss the responses given by the children with them. Lids cover while corks plug. Cups pour while straws "suck", etc. Write the name of the objects or make drawings of them on the board and below these write all the ways that the children generate in which they differ.

Lesson: Group children in threes and repeat the activity of Similarities and Differences (Alike), but with an emphasis on *differences*.

Extensions: Repeat both sets of lessons lessons frequently with different kinds of objects to identify properties by which they might be classified - roughness, size, softness, shape, color, use, material made of, etc. Children need a lot of experience in identifying how things are alike and different.

## SORTING 1: ONE PROPERTY

MATERIALS TO USE: Each class should have a small box of "odds and ends" - bottle caps, plastic and metal lids, buttons, old keys, pasta shells, odd sized pieces of wood, etc.

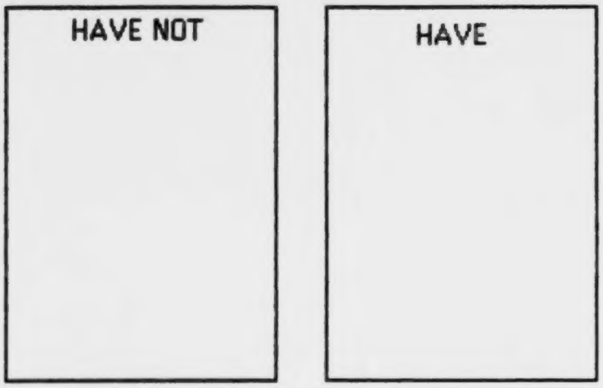
You should have containers with several classifiables in them: shells, nuts, pasta shells, buttons, bottle caps, lids, leaves, plastic toys, nuts and bolts, seeds, beans, paper items, plastic items, wood pieces, keys, "junks", picture cards, etc., sorting trays or mats.

Background: Sorting or Classifying lessons will begin with simple sorting by being alike on one property. Children should become able to keep the property used to initiate the classifying in mind throughout the classification and not switch properties. When sorting on a single property, emphasize the difference between "having" and "NOT Having" that property. Those things outside the collected ones are NOT.

Sorting by the joint presence of two or more properties is multiple classification and more difficult. This must be introduced only after children can sort well by one property and understand NOT. Multiple Classification involves AND, i.e., red AND square.

Don't be surprised if few children handle the class inclusion lessons. This is the most difficult aspect of classification and is very slow in developing in the thinking of children.

Introduction: Remind children of how things were found to be "alike" and "different". Give pairs of children a sorting tray or mat, and a small collection of objects.



SORTING TRAYS OR MAT:

Activity: Ask them to put all those alike in the SAME way in the same place on the mat or tray. Observe whether they USE properties consistently as identifying those that are ALIKE in the SAME way. Do any children begin using one proerty, then switch to a different property to put things in the same collection? Ask children about collections they have formed. How are these alike? How are they different? Why does this (one object) belong with the others? Pick one outside the collection: "Should this be in your collection? Why, or Why not?" "Why do all of these belong together?"

Extension: This single property sorting should be repeated often. Ask children to use a different property each time so they MUST look for properties other than the obvious ones. In this way they are more likely to recognize a joint presence of two or more properties, e.g. "smooth AND two holes."

## SORTING 2: ONE PROPERTY

MATERIALS TO USE: *Treasure Chests* consisting of objects that children have collected and stored in a container such as a shoe box. Objects can be anything such as buttons, bottle caps, plastic vials, randomly sized pieces of wood, etc. Sorting boxes.

Introduction: Show the children a collection of 6 or 7 objects that are similar to those in their *Treasure Chests*. Tell them you want to sort them into two groups. Ask them to suggest ways that this might be done. As they do, sort that way, even if this will not work, to get two groups. If this happens, discuss why this doesn't work. When a single property is suggested - "all smooth," "all round," "all with two holes," etc., then point out how the others are NOT that property, e.g. NOT SMOOTH, NOT ROUND, etc.

LESSON: Ask the children to sort the materials in their *Treasure Chests* into two groups. Observe how they are choosing an attribute or property to use and frequently discuss results, ask questions, etc.

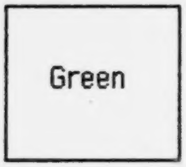
Extensions: When children are comfortable with choosing one property to sort into HAVE and HAVE NOT collections, push the sorting into three groups, then later into four groups. Also extend sorting into other areas such as sorting objects into those that *sink* or *float*, those that can be attracted by a *magnet*, those that *roll* or don't, etc.

## SORTING 3: MORE THAN ONE PROPERTY

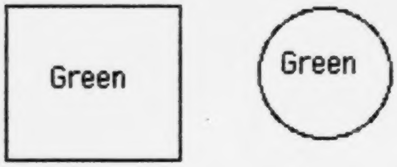
MATERIALS TO USE: Attribute blocks with shape, color and size or some similar material where children can easily see the joint presence of two properties in a group.

Introduction: Using overhead transparancy models of the attribute materials used, either commercial models or those you make from colored transparency film, or on a large set of attribute blocks such as ASCDBLOCS.

Place one piece on the overhead or on a large sorting mat on the floor.
Example:

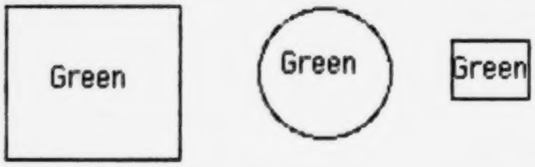


Select a second piece, a large green circle and place it in the same sorting location.



Ask the children why they think you placed that with the first. Discuss answers.

Then place a third piece on the other location.



Ask the children again why these have been collected together. Discuss with them why being square is not part of your rule for putting the things in the same place.

Pick up another piece and ask the children where it should be placed.

Again talk about the suggestions made. You should be getting close to the point where someone is recognizing being green AND large is the rule. As you add each piece to the sorting, ask questions like, "Can this piece go here?" "Why can't this piece go there?" "What's my rule for sorting these pieces?"

LESSON: Have the children sort the materials in their treasure chests so that those in a collection are ______ and ______. As they do this, ask "Why do these belong together?" "Does this belong, too?" "Can you name this collection?"

Extensions: Encourage children to sort in a different way, but ______ and ______.

Invent poems and songs to go with sorting. "Put this in the loop, if it goes with the group. If you have a ______, it goes in your loop!"

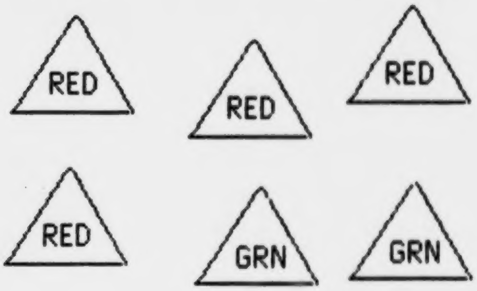
Children can sort pictures, shoes, jackets, caps. They can sort shapes made on geoboards as to pins inside, number of sides, etc. They can sort themselves into those having blue closing on v. those with no blue clothes on; those with black shoes AND black on clothing, etc.

Sort objects so those in the needed group are ______ and ______ and ______.

## SORTING 4: INCLUSION

MATERIALS TO USE: Unifix cubes, plastic animals or some other set of materials that contains subclasses.

Introduction: On the overhead projector place colored transparency shapes in two colors, but all of the same size:



Ask the children, "Are there more triangles, or red triangles?" Discuss this fully - the green triangles are also triangles. Children tend to compare the 2 parts, green v. red, instead of the part to the whole.

Extensions: Repeat this kind of activity often:

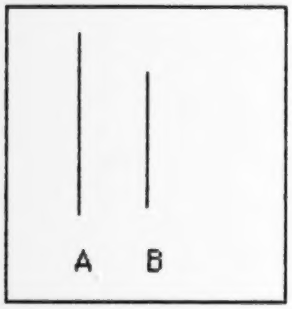
Plastic animals: "Are there more dogs or animals?"
Nuts: "Are there more peanuts or nuts?"
Unifix Cubes: "Are there more red cubes or cubes?"
"Are there more red stockings or stockings?"; "Are there more boys or children?", etc.

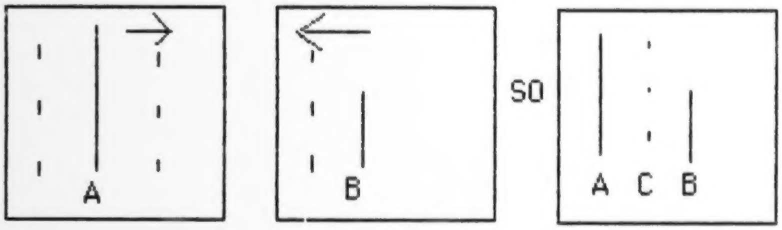
## ORDERING 1: LENGTHS

MATERIALS TO USE: Pieces of wood of different lengths, Unifix cube lengths, pieces of cloth or paper of different lengths.

Background: Ordering is an extension of comparing and requires comparing to accomplish. Ordering or seriation develops slowly. Children should first be able to order three things, then having ordered two, insert a third into that order. Ordering skill requires being able to order a given collection, insert into existing orders and extend existing orders. The number of things to be ordered must be increased slowly. Lengths, areas, volumes should be ordered as available.

Introduction: Demonstrate ordering three things on the overhead projector using sticks, rods, straw pieces or something else. Do this by first comparing two of these:





Then take the third one and compare it first with **A**, then with **B**. Point out how comparing with **A** lets you decide on which side of **A** it goes and comparing with **B** then lets you decide as to between **A** and **B** or beyond **B**.

LESSON ONE: Have the children measure various lengths in the room with UNIFIX cubes and order the resulting lengths.

LESSON TWO: Give groups of 2 children an envelope with 3 different soda straw lengths, stick lengths, etc., to put into order.

LESSON THREE: Ask the children to estimate the lengths of different objects in the room and order these. An example might be: book, desk, table.

LESSON FOUR: Organize children into groups of two or three. Give each group a collection of 3 different lengths in 4 or 5 different modes - sticks, soda straws, strips of flannel, etc. and ask them to order those that are alike in material. Are they able to find those that are alike in material? Are they able to order those made of the same material?

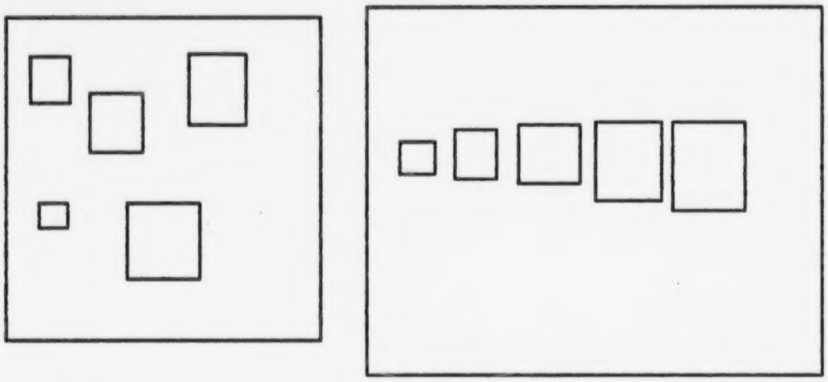
Extension: Use lengths of different kinds of material. Gradually increase the number of lengths to be ordered.

KINDERGARTEN

## ORDERING 2: AREA

MATERIALS TO USE: Paper or cardboard shapes such as squares, circles, triangles, etc. of differing sizes; "feet", "hands", etc. of differing sizes cut from paper, other similar, but differing size shapes that are seasonal. Examples are paper pumpkins, paper fir trees, paper rabbits, etc.

Introduction: Using paper squares on the overhead projector, repeat the demonstration as done with lengths. Go slowly and carefully, always reminding children of the comparisons they are making to accomplish the ordering.



LESSON ONE: Children should have collections of materials like those specified, and be placed in small groups of 2 or 3 to do the ordering tasks. Repeat ordering by areas as often as necessary, but with different shapes that have areas.

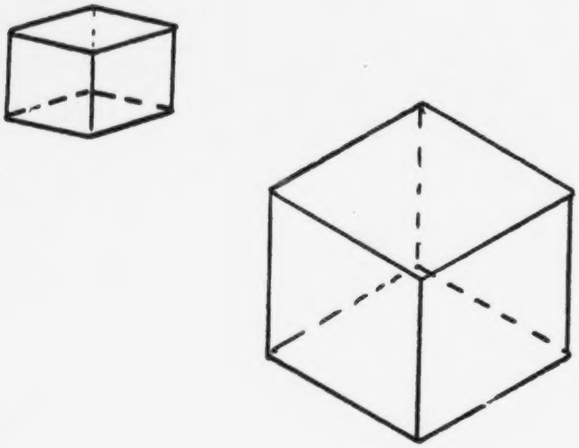
LESSON TWO: Have the children estimate the areas of the largest surfaces of different objects in the room and suggest and order. An example might be: book, construction paper, desk, floor.

Extensions: This kind of activity has the advantage of giving children experience with shapes that are similar - that is, alike in shape, but not size. You might ask for other examples of this that children have recognized - a photo and its enlargement, for example.

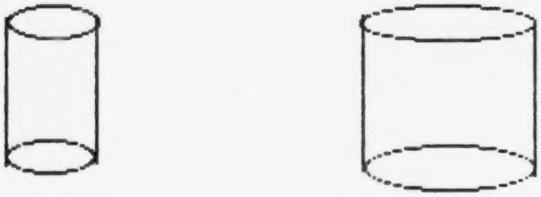
## ORDERING 3: VOLUMES

MATERIALS TO USE: Three dimensional objects that are basically alike but vary in volume, such as cubes, spheres, "Russian" nesting dolls, other nesting shapes.

Background:

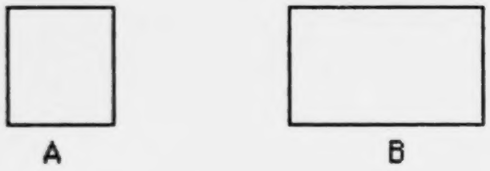


A



B

Cubes like those in **A**, are similar in that ALL dimensions increase at a uniform rate when they are enlarged. The cylinders in **B** can be ordered by volume, since the volumes vary as cross sectional area when the heights are constant. However, they are not similar in that one dimension has remained constant. An analog on a plane is:



The base has increased from **A** to **B**, but the height has remained constant. The area of **B** is greater than that of **A**.

Using shapes that are not as similar as possible forces children to consider simultaneous variation in two or more properties, rather than merely uniform increase.

Introduction: Since this should not be introduced until children have become accustomed to ordering lengths and areas, you can proceed directly to the *Lesson* with minimum explanation other than a request to arrange from smallest to largest.

LESSON ONE: Give children a set of 3 similar Geoblocks, i.e., 3 cubes, 3 rectangular solids, etc. Ask them to place these in order of volume. Watch carefully for confusion on some of those cases where change in one dimension is compensated for by change in another. Children likely will be able to order ONLY SIMILAR cubes, cylinders, spheres, etc.

LESSON TWO: As a group activity, have the children help you order "nesting" square boxes, Russion dolls, etc.

Extension: Many kindergarten children will not have a well developed concept of volume constancy and will find ordering by volume challenging. Do not be discouraged if not all of your children can do this kind of ordering. Fill one milk carton 1/4 or so full of sand, another 1/2 or so and another full of sand. Ask the children to order these.

# KINDERGARTEN

## PATTERNS 1: CREATING

MATERIALS TO USE: Pattern Blocks, Parquetry Blocks. Cuisenaire Rods, Unifix cubes, paper facsimiles of these, Treasure Chests, colored beads and string, etc.

Background:: There are several stages in the development of pattern related thinking. The first and probably most important of these is the free creation of patterns. After children have had the opportunity for free play with the different materials you have available encourage them to create different patterns with them.

Children must have much experience in working with patterns. Patterns are ever-present throughout the learning of mathematics. The order in which children should be involved with patterns is:

Creating, copying, differentiating like and different patterns, extending patterns, translation from one medium to another, inserting missing elements into patterns, reversing patterns. In Kindergarten most pattern work should be of the first three or four kinds.

Some examples are:

1. Unifix Cubes - create patterns of color in making links.

2. Cuisenaire Rods - make animals, birds, houses, cars, etc. from them. Make patterns of color and length.

3. Pattern Blocks - create patterns for floors, for walls, etc. Cover specified outlines such as a sheet of construction paper, a plastic ice cream pail cover.

4. Geoblocks - make houses, stores, ramps, garages, etc.

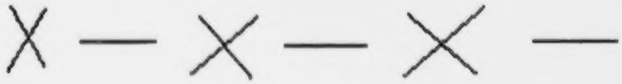
5. ASCDBlocks - make trucks, rackets, cars, animal shapes, etc.

6. Other materials such as wallpaper samples, and pieces of yard goods can be used to create patterns.

In this lesson several suggestions are given for pattern creation activities.

Introduction: With overhead transparency versions of whatever materials you have to use of those mentioned above, demonstrate how these can be used to create linear patterns, border patterns, spatial patterns (Pattern Blocks and Parquetry Blocks), color patterns, shape patterns, etc.

(Toothpicks)



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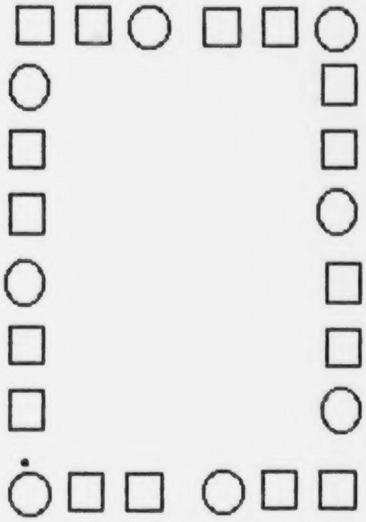

LESSON: Have children use whatever materials you furnish them to create something - to represent a house, an animal, etc. Watch for their use of a repetition of arrangement, symmetric arrangements, etc. Encourage them to find different ways to make patterns of their materials and frequently ask them to describe these as best they can.

Extensions: Start with patterns of 2 different objects, then to 3 different objects in a pattern.

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It is unlikely kindergarten children can make patterns with 4 or more different items.

## PATTERNS 2: BEGINNING TO COPY

Introduction: Introduce copying of patterns by using sounds, use of the body, etc. before using letter, numeral, or body patterns. Have the children do the pattern along with you.

Examples:

Using body: snap (fingers); clap, clap (hands); snap, clap, clap; clap, slap (leg), clap, slap, etc.

clap, stamp, stamp (feet); clap, stamp, stamp

Touching body: nose, nose, mouth; nose, nose, mouth

nose, mouth, ear, nose, mouth, ear

elbow, knee, stomach, etc.

Naming colors or letters or numbers: red, blue, blue, red, blue, blue, etc.

six, six, one, three; six, six, one, three

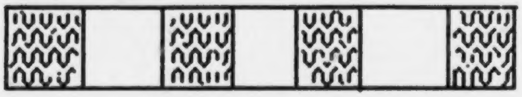
"A", "B", "A", "B", etc.

Have the children set these patterns for others to follow, ("playing teacher"). Have individuals suggest patterns for you to lead.

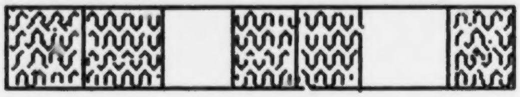
Familiarity with oral patterns is necessary before using other materials.

## PATTERNS 3: COPYING

Introduction: Make a pattern of Unifix Cubes or colored beads on a cord:



Give children Unifix cubes of the same two colors and ask them to make a pattern of Unifix cubes like yours. Describe the pattern and have the children also sound it out - "black, white, black, white, etc." Make a second pattern, different from the first:



Repeat the activity of (1) having the children copy it, and (2) orally describing it.

Tell the children they are now to make a pattern you will only describe, "black, black, white; black, black, white, etc." Have the children suggest patterns of color to make with the Unifix cubes.

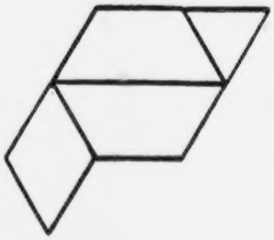
Repeat this kind of activity with other materials such as pattern blocks, "triangle, square, triangle, square, etc."

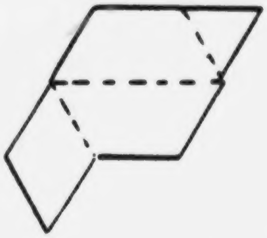
MATERIALS TO USE: The same kinds of materials as in Patterns 1 and Pictures of Patterns made from Pattern Blocks, etc. These can be made or found in commercial sources such as Pattern Block Problems for Primary People.

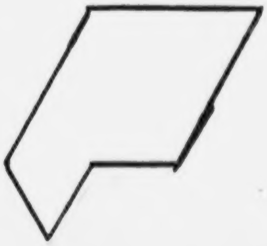
Extensions:

1. There are several ways to do this. One way is to make a pattern and then make a second just like it. Another is to make an overhead transparency of a shape with lines showing how the shape can be covered with Pattern Blocks, Parquetry Blocks, etc.

Example:







2. Give each child some pattern made of the material the child is to work with and ask the child to make another just like it.

3. Make Unifix cube links of 5 or 6 links with different patterns of color. Give the children a set of 4 or 5 links of this kind in which 2 links are alike or only one link is different and ask the children to find out whose pattern is (a) alike or (2) different from the others.

4. Have children copy linear patterns of colors, letters, shapes, etc. as well as patterns that cover an area. Each child should work with a variety of materials from which patterns are made.

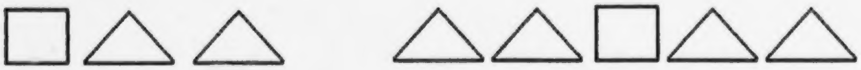
5. Cut a square piece of patterned wall paper or fabric into LARGE jigsaw puzzle pieces and have the children assemble these pieces into the square.

## PATTERNS 4: COMPLETING

MATERIALS TO USE: Materials that can be made into a pattern to cover an area or occupy space such as Patterns Blocks, parquetry blocks, paper shapes of colored paper, Cuisenaire Rods, Geoblocks.

Background: This lesson is to give children experience in inserting missing elements into patterns that are already started. This requires identification and retention in thought of the pattern and selection of an appropriate piece or pieces to complete it.

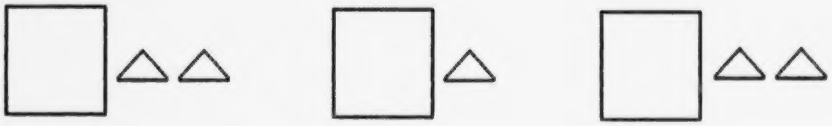
Introduction: Put an incomplete, but recognizable pattern on the overhead using transparent materials.



Ask the children which shape:

□ or △

should go into the missing space. Make a second pattern that has a missing element or elements:



and again ask which

□ or △ should go into the pattern.

LESSON: Give each child several of two different shapes of pattern blocks or two different colors of Unifix cubes along with appropriate activity sheets similar to the examples. Ask the children to make the pattern on the card and to color the shapes in the completed pattern.

SAMPLE ONE:

△ □ △ _ △ □ _ □ △ □

□ △ △ □ △ _ □ _ △ □ △ △ _ _

△ △ □ □ △ _ □ _ △ △ □ □ _ _

△ △ □ □ _ △ △ □ □ □ _ △ _ □ □ _ _

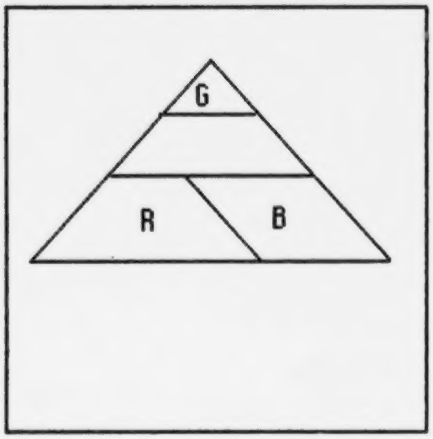
SAMPLE TWO

R G R G _ G R _ R G _ _

G G R G _ R G _ R G G _ _

G G R _ R G _ R R R G _ _

**Extension**: Give pairs of children 10-15 pattern blocks and some prepared cards like this:



The children are to place the pattern blocks as to complete the outline.

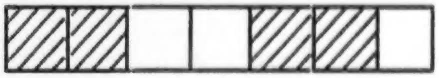
KINDERGARTEN

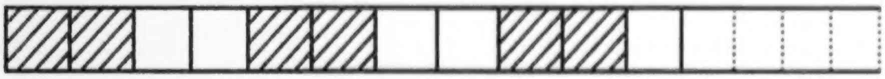
## PATTERNS 5: EXTENDING

MATERIALS TO USE: Same materials as with previous activities. Once children are accustomed to the materials, paper or sticker versions can be made or bought - colored paper squares to represent Unifix cubes, for example.

Introduction: Make a pattern of colored transparent squares on the overhead projector:

original





extended

Ask the children what comes next in the Pattern. Discuss the composition of pattern and why

☐ should be next.

Ask the children what comes next in the Pattern.
Again, be sure to see that

▨ is needed to continue the pattern.

Ask the children to orally give the names of the colors that should be added in order to continue the pattern.

LESSON: Give each child several of each of two different color Unifix cubes. Start the pattern by placing the color squaraes to represent Unifix cubes on the overhead projector or flannel board. Ask the children to use ALL Unifix cubes and make that pattern. When all have finished, have several stand in front, holding their "Pattern" links in front of them so all can see if the patterns are the same. Discuss any irregularities identified.

Extensions: As you check the children working, suggest related activities such as:

1. Reversing the pattern
2. Exchanging the pattern, e.g., red for blue and blue for red
3. Extending the pattern in both directions.
4. Have the children orally describe their patterns, e.g., red, blue; etc., short, long, long; button, button, nail; etc.
5. Use sound patterns such as snap, clap, snap, clap...or foot stamp, hand clap,.....
6. Children lined up as facing front, facing back, etc.
7. Writing numerals in patterns
8. Writing letters in patterns
9. Patterns of body movements
10. Patterns of water paint smears
11. Start patterns of shapes using Pattern Blocks, or shape and color using colored beads on a string. Have the children use the same material to extend and continue these patterns.
12. Make the children pattern conscious by asking them periodically to describe patterns they have seen in school, at home, on a trip, etc.
13. Make patterns of numerals and have the children combine these by writing following numerals. This will require a prior skill in writing the numerals. However, you can make patterns using just those numerals that can be written. An example is: 112221122211222.
14. Have the children paste paper shapes to continue a pattern.
15. Have children continue sound patterns you start, or patterns of body movement you start.
16. On physical activities, emphasize patterns such as "hop, step, step, hop, step, step," etc.

KINDERGARTEN

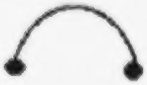
## PATTERNS 6: TRANSLATION

Background: When children are able to translate a pattern from one medium to another, you will be able to give a variety of stimuli to have them create patterns or continue patterns. Some examples of such tranlations are:

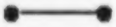
Sound to written symbols; to materials; to actions
Written symbols to color; to shape; to other written symbols
Shape; color to written symbols; to sound

Information: Sound to Written Symbols:

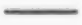
Use dot paper. Agree upon a translation such as "clap" is a



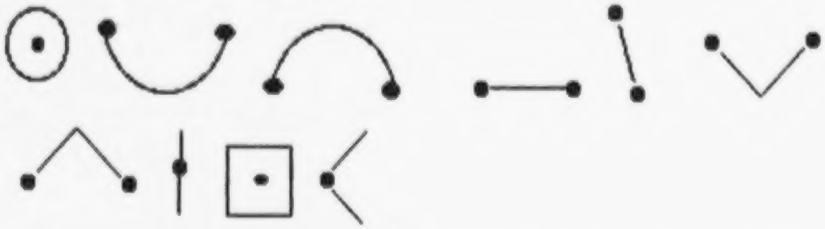
and "stamp" is



As you give the sound pattern, children are to create the pattern of

and 

on the dot paper. Varieties of dot patterns can include:



Sounds can be associated with writing letters, numerals, etc.

## Sound to Some Material:

Using UNIFIX cubes, associate "clap" with "Red", "stamp" with "White" for example. The sound stimulus for a pattern results in that pattern of colored cubes in a link.

Using "Treasure Chests", children choose which of their materials to correspond to "snap" and "clap" or "stamp."

## Written Symbols to Materials:

Using letters a pattern such as ABBABBABB can be generated. Children associate with each letter a color, a shape, etc. and create the materials pattern from that letter stimulus.

You can use other written stimuli such as numerals, words to establish the pattern.

## Material to Written Symbol:

Relate □ to "2" , △ to "3" for example.

Establish the pattern with a pattern of shapes on the overhead or flannel board. Have the children write the numerals following that pattern.

## KINDERGARTEN

### PATTERNS: EXTRAS

Here are some things to do with materials you might have on hand. Use these with individual children or when you have a block of a few minutes with a group.

With UNIFIX Cubes

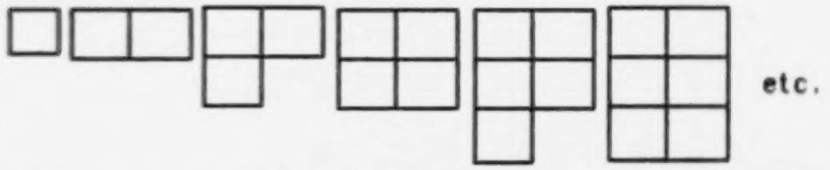
1. Put 3 different colors of Unifix Cubes on the fingers of one hand. Show your hand to the children. Ask them to close their eyes. Remove one cube. Ask the children what color cube was removed.

2. Make Unifix links of 7 or 8 in 4 different patterns, plus 1 that is a duplicate of one of the 4. Have a child select the two that are ALIKE.

3. Make a similar set, but with one DIFFERENT from the others. Ask the child to select the DIFFERENT link.

4. Make vertical link patterns. "What cube comes next?"

5. Make number pattern cards. Have the children place Unifix in the squares on the cards.

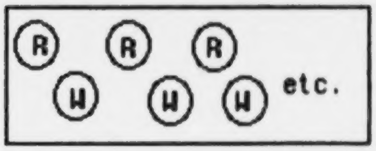


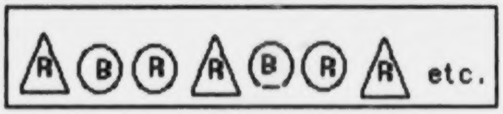
6. Make a Unifix link of 5 different color cubes. Slowly slide this into a hollow tube. Ask the children to predict each cube as it appears at the other end.

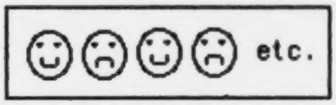
Using Pattern Strips

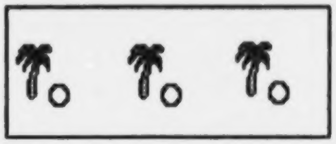
Make patterns by pasting or drawing pictures on a strip of heavy cardboard. Pattern Block and other "stickers" are good for this or use a colored felt pen. Cover with a tube or a blank card. Slowly slide the strip out one item at a time and have the children predict what will come next.

Some strip examples are:









Making Border Patterns
Have children make borders on construction paper in different patterns using a letter stimulus like AA BBB AA BBB.

Making "Veggie" Patterns
Have children make patterns on long toothpicks out of colored miniature marshmallows, different colored raisin, etc., and stick these into a large styrofoam ball, orange or apple.

Record patterns found on wallpaper samples and on shirts, T-shirts, or sweaters using Unifix cubes.

Using Treasure Chests
Make patterns out of macaroni, colored "twists" that come with Gladbags, etc.

Using Geoboards
Make patterns on Geoboard pegs using colored squares, Unifix cubes, "Treasure Chest" items like washers, nuts, etc.

Copy Geoboard patterns onto dot paper.

Rolls of colorful stickers are often on sale, particularly after Christmas. Use these to make patterns, pattern strips, etc.

Paper chain patterns are still in style.

# KINDERGARTEN

## COMPARING 1: LONG-SHORT

MATERIALS TO USE: Unifix cubes, sticks of wood, twigs, etc., of different lengths, string, work mat, small boxes with 10 of these items of different lengths in each box.

PURPOSE: This is one of several lessons to give children experience in the use of a basic intellectual process - comparison.

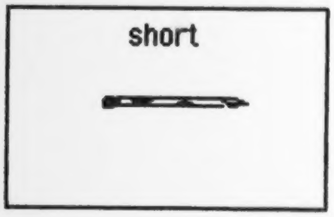
Background: Long-short comparisons serve as a foundation for later activities that involve measurement, particularly if questions are posed that have children mentally and visually estimate if *shorts* can be accumulated into *longs*.

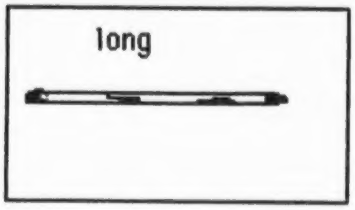
Introduction: On the overhead, or at the center of a seated group, place the Work Mat. Select two objects and show them to the students. Ask which should be placed in the *long* column, that which is in the left hand, or that which is in the right hand. Discuss any confusions that may become evident about meaning of the terms *long*, *short*, *left*, *right*. Place the items in the correct location on the mat. Remove objects from the mat. Do a second example and discuss. Continue until 3 or 4 pairs of objects have been compared.

LESSON: Have the children work in pairs. Give each pair a work mat and a box of ten items. Have each pair of children choose a pair of objects from their box. Ask them to place these in the correct column on the mat (there are 45 possible pairs to be chosen!) Move around and observe what the children are doing. Ask questions or make suggestions as appropriate. An example might be, "How many of the short ones would be as long as the long one?" "Would you need two of the shorter to match the length of the longer?"

Extension: Repeat this lesson periodically until children seem well able to distinguish and order these lengths in pairs.

## ILLUSTRATION OF INTRODUCTION AND LESSON OUTCOME:





KINDERGARTEN

## COMPARING 2: LONG-SHORT

**MATERIALS TO USE**: Lengths of string, scissors.

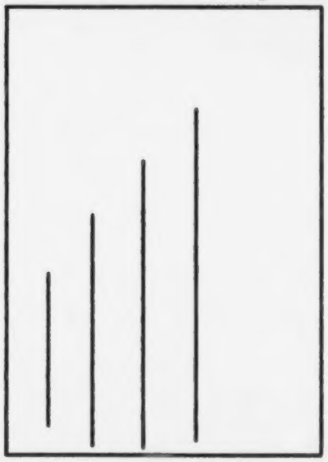
**PURPOSE**: This lesson is to give children an intuitive measuring experience, and to obtain quantities to compare as to length.

**Introduction**: Measure the circumference of your head. Use this length of string and find two lengths in the room that are longer than this and two that are shorter. To help identify such objects in advance, your head circumference will be in the range of 18-24".

**LESSON:** The students should work in pairs to obtain string lengths equal to *the distance around* their heads and to find two lengths - desk edges, door edges, book edges, etc. - that are shorter and two that are longer for each of their head string lengths. Monitor the activity, paying partiulcar attention to the language being used by the children. Be sure they are using the string by stretching it tautly when comparing it to the various lengths.

**Extension**: This lesson can be repeated using different lengths of their bodies - elbow to fingertip; knee to floor; arm length, etc.

1. All body part strings in the class can be ordered by length by the children and graphed in some way after they have been used for measuring. Example: *head* strings pasted on a sheet of paper



2. All strings from an individual child with different body parts can be ordered and pasted onto a chart in the same way.

3. Have the children "count off" by 2's. Have all of the 1's stand in one line and all of the 2's in another line. "Which line is longer?"

KINDERGARTEN

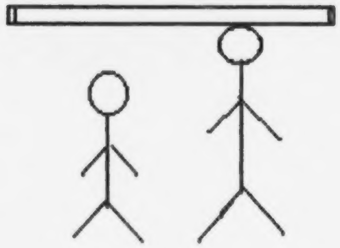
## COMPARING 3: TALLER-SHORTER

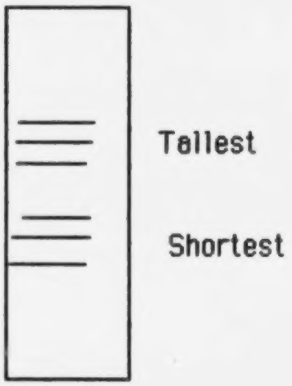
MATERIALS TO USE: Children, ruler, marking sheet.

PURPOSE: This lesson is to give children an opportunity to compare their own heights, order themselves and graph the results. Ask the children to group themselves in fives.

Introduction: Select one group of five children. Ask one child to be the standard. A second child is asked to stand back to back with the "standard" child. First ask the rest of the children which is taller. Then use the ruler or a flat board to compare the heights. If the second child is taller, place the child to the "standard's" left, otherwise to the right.

LESSON: Compare the remaining three children to the standard and place each to stand in the "taller" or "shorter" group, as appropriate. Then ask the children in each other group to try to arrange themselves so the "tallest" is farthest to the left, and "shortest" is farthest to the right. Give whatever suggestions are needed to help them arrange an ordered five-shortest to tallest. Go back to the original group. Starting with the shortest, have each stand at the marking sheet using the ruler and mark the height on the sheet with a marker. You should have a set of marks ordered vertically when finished.





Extension: Repeat this, gradually increasing the number of children in a group and using different groups of children. Keep a growth chart for each child in your class, measuring the height monthly during the year.

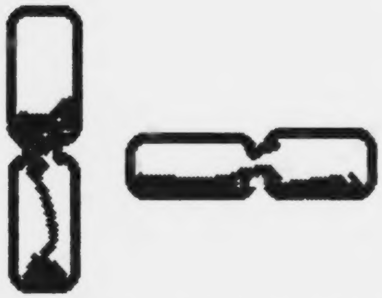
KINDERGARTEN

## COMPARING 4: SLOWER-FASTER

MATERIALS TO USE: Plastic can covers or other discs with different size nail holes punched in them, labelled with numbers, or of different colors; egg timers; clear containers for water.

PURPOSE: This lesson is to give children an opportunity to judge passage of time or length of time interval, and to use a simple timing device.

Introduction: First demonstrate to a small group of children the release of a lid, watching it fall through the water and you turning over the egg timer as the sinking starts. When the lid reaches the bottom, turn the timer sideways to temporarily stop the fall of the sand and allow the children to see the level.



Do this again with a second lid and second timer. Then show the two timers and compare them. Talk about which lid took longer to fall as shown by more sand falling through the timer and a higher level of sand when lying sideways.

LESSON: Assign children in groups of two with a timer, water container and 2 disks. Ask them to find out which fell for the longest and which the shortest time. Then add a third disk and ask them to find if it is faster or slower than the *fast* disk and faster or slower than the *slow* disk. Then talk about ordering the three disks using the times taken to fall to the bottom.

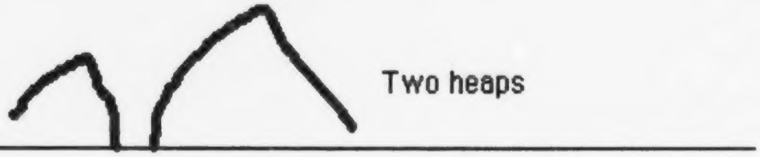
Extension: Use other methods to record time lapse such as clock hands, or the length of a line drawn on a piece of paper with a steady pace. Judge time intervals for other events. Some examples are: time to dissolve a sugar cube v. an alka seltzer tablet; time to melt two different ice cubes; time to walk across the room v. time to walk length of room. The idea is for children to make estimates, not accurate measurements.

# KINDERGARTEN

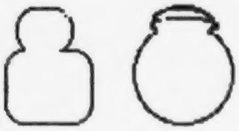
## COMPARING 5: MORE-LESS CONTINUOUS

MATERIALS TO USE: Sand, rice, a variety of cans and bottles of different sizes and shapes, a "standard", an easy to fill and pour container such as a small, unmarked measuring cup, paper cup, etc.

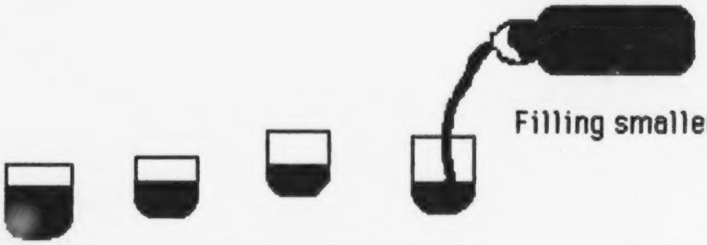
Introduction: Show the children two different jars or cans having different sizes and different shapes. Ask them which holds more sand (rice). Tally the votes as indicated by a show of hands. Then ask for reasons why they think as they do. Do they judge by height of the jar? Width of the jar?, etc. Then ask them how to find out which does hold more. One way is to fill them and then carefully pour out into two cone shaped heaps and judge from these. Another is to use a "standard" (the measuring cup) to compare how much they hold. The number of cups needed for each can be counted. Another way is to fill one and pour into the other and see if there is too little, too much or just the right amount to fill the other.



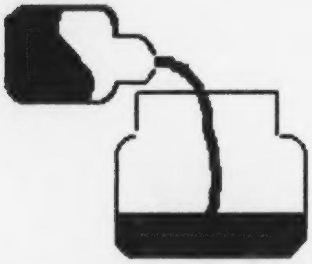
Two heaps



Two different jars



Filling smaller cups



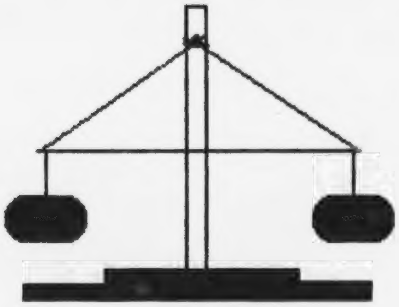
## Smaller into Larger

LESSON: Assign children in groups of two with two jars of different size and shapes, a measuring cup and some sand or rice in a container. Ask them to determine which holds the most, and which holds the least. Then add a third jar and have them try to order the jars according to their capacities.

Extension: Add more jars; use different measuring standards; label the jars with cards showing MORE and LESS; MOST, LEAST, etc.

## COMPARING 6: HEAVIER/LIGHTER

MATERIALS TO USE: Balances, cards with HEAVIER and LIGHTER printed on them, several common objects of differing weights, work mats. Simple balances can be made from the bottom halves of milk cartons, string and clothes hangers. A support stand can be a narrow board with a nail in it attached to a base.An inexpensive commercial balance is made by OHAUS and is called a PRIMARY BALANCE:



Introduction: Demonstrate the rise of the balance by setting it up so all the children can see. Show them 2 different length links of UNIFIX cubes and ask which is heavier. Discuss this term if necessary.

Place the UNIFIX lengths and point out how the HEAVIER object causes that side of the balance to go down and LIGHTER side to go up by comparison. Be sure children ALL understand that this is how the balance works. Refer to a teeter-totter as an example.

LESSON: Place the cards by the objects to show which is HEAVIER and which LIGHTER.

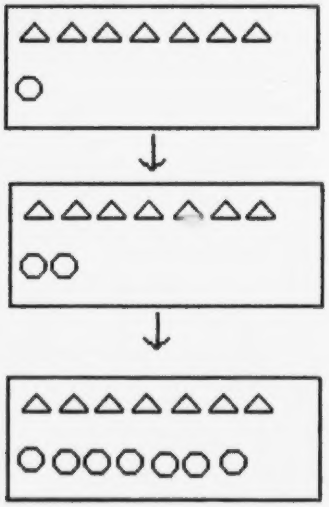
Pair the children. Each pair is to have a balance and several common objects such as different size blocks of wood, UNIFIX links, chains of paper clips of different length, bottles of different size, etc. The children are to compare the weights of two objects, then place the cards above the two objects on the work mat to show which is HEAVIER and which is LIGHTER. Monitor to see that this is O.K. Then have the children compare the two different objects.

Extension: Ask the children how they might go about ordering three of the objects by weight.

## NUMBER CONCEPT 1: ONE TO ONE CORRESPONDENCE

Background: 1-1 correspondence is used in many ways - children must make a 1-1 correspondence between counting words and objects in rational counting of a collection of things. They must make a 1-1 correspondence between objects of two collections to see if they are equal in number. 1-1 correspondence should be made between collections of real things, not pictures on pages. They must **establish** such correspondences, **recognize** such correspondences and **conserve** such correspondences when one or both collects are physically rearranged.

Introduction: On the overhead projector or flannel board, set up a row of seven or eight objects such as geometric shapes, pictures of cups, etc. Demonstrate to the children the establishment of a second row in 1-1 correspondence by adding one at a time, pointing out how you are placing, one of those for EACH ONE in the first row.



Ask some questions and play off children's responses to be as sure as you can be that they get the idea of "one of these for each of those."

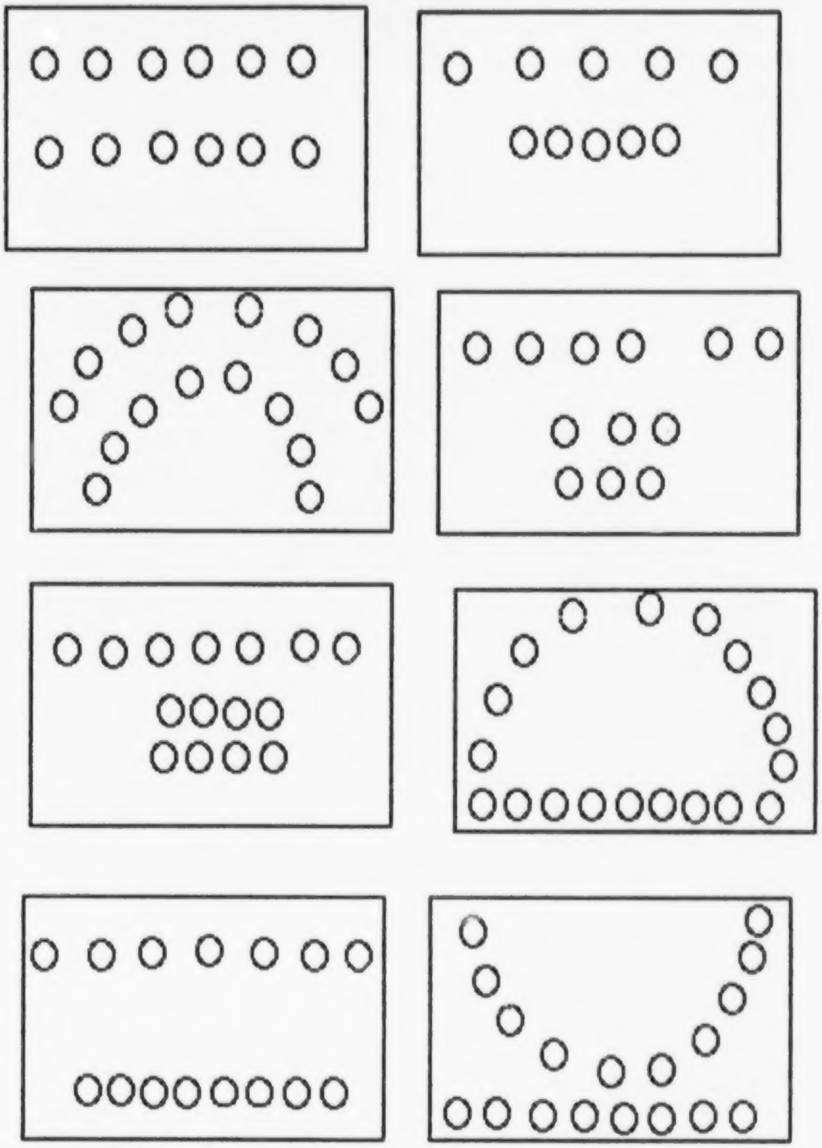
LESSON: Each child should have several of 2 different kinds of objects. Have the children pick their favorite of the two kinds and make a row of four of these. Then ask them to make a second row with the others so there are four in that row and each in the first has a "partner."

Have them make increasingly larger collections of objects in 1-1 correspondence, i.e. five in each, six in each, etc.

**Extension**: Repeat with common objects in the classroom such as:

- a child for each chair
- a cookie for each child
- a spoon for each glass
- a square of each triangle
- a UNIFIX cube for each child
- a hat for each puppy
- a penny fo each toy
- a milk for each child
- a man for each horse (picture cards)

Make cards with colored dots and have the children select those that have the colors in 1-1 correspondence:



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## NUMBER CONCEPT 2: COUNTING I

Background: A fully developed concept of number has several components, including counting, 1-1 correspondence, recognition of invariance of number property under physical rearrangement, part-part-whole properties, the successor relationships in our number system and the use of number for ordinal purposes. A child does not really "conserve" numbers until all of the components are integrated into a fully useful concept of number. These lessons will include some experience with all components, with emphasis on those easiest for children to see.

Introduction: First assess each child's knowledge of the counting of the results, words by asking each to count as far as possible orally. Regardless of the results, do several activities to make certain all children know the counting words in correct order.

Use the familiar word songs that use counting words in order such as "One, two - buckle my shoe," etc., or "Five little birdies sitting by the door,"; " A little ball, a bigger ball, a great big ball, I see," etc.; "One little boy all ready for bed, etc."; "Rub-a-dub-dub, three men in a tub, etc.", "Number one, number one, gaily round the room I run; Number two number two, may I come and play with you?, etc.", "Here I come - number one, see how fast I can run;" etc., "Two little birds, two little eyes", "Little next." "This Little Pig"; "How many fingers?"; "Ten flowers For my Garden," and "Ten Little Soldiers." (See Appendix for several complete rhymes and verses of this kind.)

"Count off" to form groups - 1 through 4 for 4 groups, for example. All 1's go into one group, 2's into another, etc.

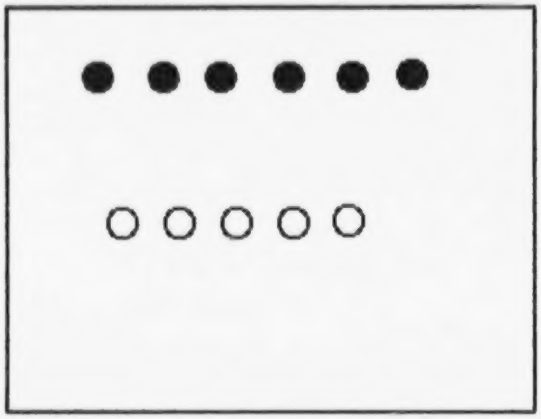
Count while clapping - one count/clap. Do rhythmic counting: one, two...three,four...or one,two,three....four,five,six...., etc.

Extended Counting: Children will have trouble with the oral sequence when they reach the teens. Work through these one at a time and try to make sense of each of the words - as difficult as this is in the English language. Set up a can and one at a time, drop washers into it. The children are to count out loud the washers as they are dropped into the can. They should do this with their eyes closed so the only stimulus is sound.

## NUMBER CONCEPT 3: COUNTING 2

**Background**: This lesson is to give experience with using 1-1 correspondence to determine "more" and "less" with discrete (or countable) collections.

**Introduction**: On the overhead projector or flannelboard, place two rows of objects - two colors of counters, buttons and bottle caps - two different shapes, etc. - that are not in 1 to 1 correspondence.



Ask the children (a) if there are as many in the top row as in the bottom row. Be sure they all see they are not in 1-1 correspondence. Then ask questions about which has MORE and which has LESS or FEWER. Work at this until the children can recognize MORE and LESS or FEWER.

**LESSON**: Give the children several different situations of collections of countables unequal in number to identify using MORE and LESS or FEWER. Some examples follow:

1. Prepare several cards with different numbers of dots on them. An example is ranging from three to twelve dots. Each child should have a set. Select one, five for example. Ask children to hold up their cards that have MORE dots than yours. Select another and ask them to show the cards with FEWER dots or LESS than yours.

2. Give each child fifteen UNIFIX cubes. Place some number (one to fourteen) of chips or counters on the overhead

projector or flannelboard. Ask the children to make a link of UNIFIX that has MORE than you have. Repeat several times with different numbers and requesting links with MORE and also with LESS or FEWER.

3. Use each opportunity situations that normally arise to emphasize recognition of SAME, MORE, LESS and FEWER.

"Do more children have red on or blue on?"
"Are there more chairs or tables in the room?"
"Are there more boys or girls in the room?"
"Are there more windows or doors in the room?"

4. Have six boys stand. Ask for girls to stand next to each boy. "Are there more boys or girls still seated?" "Are there as many girls standing as boys?"

5. Put UNIFIX on some of your fingers. Hold up your hands and ask the children, "How many more UNIFIX do I need for all of my fingers?"

KINDERGARTEN

## NUMBER CONCEPT 4: COUNTING 3

Background: Rational counting is using counting words in 1-1 correspondence with objects in a collection. Children go through different stages in the internalizing of this rational counting.

When they begin, they usually must move the objects one at a time as they recite the counting words. As they do this, most children put the *counted* objects into an orderly array of some kind. The next stage is usually to touch the objects as they are counted. This is prone to frequent error since it is easy to re-count some objects if children forget they already were counted, or miss some, thinking they had been touched. The next stage is usually *eye touch* of the objects as they are counted with progressively more frequent sub-vocalization of the counting words. Children sometimes will vocalize the beginning or end (or both) of the counting word sequence used.

Rational counting at every stage is primarily a one-to-one observation of individual children. This is necessary to identify at what stage each child is and to subsequently give individualized experience and tasks.

Some children can be helped by group reinforcement. This lesson involves a group rational counting experience.

LESSON: Place objects one at a time on the overhead projector or on the flannel board and have the children count out loud as a group as these are placed there. Repeat this as many times as needed. When it seems that oral counting is associated in the children's minds with a collection of objects, continue the following as long as necessary:

1. Oral counting as a group

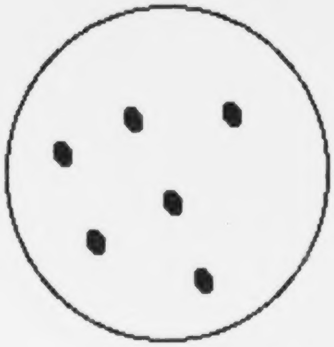
2. Individual and small group rational counting activities

Some individual or small group counting activities include:

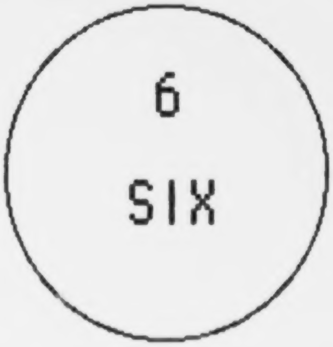
1. Children drop UNIFIX cubes, clothes pins, etc. in a bottle, counting them as they go in;

2. Form links of UNIFIX cubes, counting the cubes as they are added to the link;

3. Prepare paper plates with sticks or dots in various arrangements and different numbers. Print the numeral and word for each number on the back of each plate: Example:



FRONT



BACK

Pair the children with a collection of plates. They take turns. One child shows the front to the other. The second counts and tells the number. This is repeated until all plates are used. Then the roles are reversed.

4. Have the children stand up one at a time, counting off as they stand.

5. Use egg cartons. Have the children placed UNIFIX cubes, beans, buttons or other objects, one in the first *cell*, two in the second, etc., until all twelve have beans in them.

6. Connect egg cartons to have children who are ready count out objects up to twenty-four, thirty-six.

Additional group activites:

1. Listen and Count - (ring a bell, tap a pencil, stamp your foot, clap your hands) several times. The children are to tell you how many times you did that.

2. Count on - start the counting sequence with *three* for example, and have the children count on from there.

3. Count by twos.

4. Count by threes.

5. Count back from given numbers. Children are familiar with 5..4..3..2..1 BLAST OFF!

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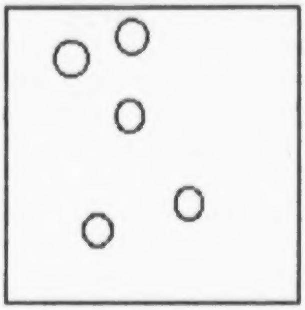
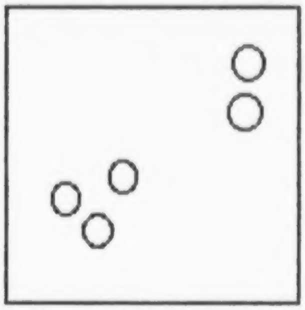
## NUMBER CONCEPT 5: PART-PART-WHOLE

Background: Recognition of the part-part-whole relationships of a given number make understanding and recall of "number facts" easier for students and contribute to a complete concept of number. These relationships should be continually referred to by asking children to differentiate parts and wholes.

Introduction: On the overhead place five or six counters as shown:



Ask the children how many counters are there. When this is settled, rearrange the counters as shown.



First ask the children if there are still *five* counters. Cover the *three* with your hand and ask how many counters are seen. Point out that *two* is part of the *five*. Then cover the *two* counters and point out that *three* is also a part of the *five*. Show the entire collection and emphasize the *five* has 2 parts - *two* and *three*. Ask the children if the *five* can be shown in *two* parts in another way. If needed, you rearrange as *four and one*.

Use a second example such as *six* counters. Ask the children how to arrange these in two parts. Do as suggested, e.g., *three and three*. Then ask for another way to make it into parts and rarrange. Ask for another way. Show then the remaining way if necessary.

LESSON: Give each child several counters. Ask them to successively make *four, five, six and seven in parts* as many ways as they can. Monitor, asking questions of each child about the part-part-whole relationships. If some child separates into more than two parts, share this with all and point out that many parts can be made of some numbers.

## NUMBER CONCEPT 6: TWO'S

Background: In developing number concept, the numbers should be developed one at a time so all components can be integrated by the child into a unified whole concept. That children have a mastery of the counting words in order is loosely related to their number concept. This lesson is to focus on *twoness.*

Introduction Ask the children to name the things that they have two of on their bodies. Ask them to hold up two fingers. Challenge them to find two's in the room. Arrange some before such as two books on a shelf, two chairs at a table, etc.

Extension: Have the children differentiate between one and two by activities involving themselves: *"Stand on one foot"; "Stand on two feet"; "Raise one arm"; "Raise two arms"; "Make a fist"; "Make fists of two hands"; "Cover one ear with a hand"; "Cover two ears with hands", etc.*

Point out two's wherever possible throughout the day, week and year, such as when cutting a banana, orange or apply in two pieces or when milk cartons come in crates with two rows of spaces, etc.

## NUMBER CONCEPT 7: 'THREENESS'

Introduction: The Lesson description and the activities suggested for *"threeness"* and *"fourness"* can be used with the numbers *five, six,* etc. You must judge when the child is ready to move to the next larger number because all previous numbers in the sequence have been internalized. This occurs when the child's concept of number is an integration of all components.

LESSON: Activities to help develop number concept are described for a variety of materials.

### Individual Activities at Number Stations:

### UNIFIX CUBES:

1. Give the child several Unifix Cubes of each of two colors. Ask the child to make links of *three* cubes of *2* different colors in as many different ways as possible.

2. Have the child put *three* Unifix Cubes on the pegs of a geoboard or pegboard in many different ways.

3. Give the child a long link of Unifix Cubes. Ask the child to break off links with *three* one at a time. Count how many *threes* you have. Ask the child to break off *three* links of *two* Unifix Cubes.

### BEANS AND CUPS:

1. Give the child several beans and some paper cups. Ask the child to put *three* beans into each cup.

2. Ask the child to make *four* groups of *three* beans on a sheet of paper.

### COLORED BEADS AND CORD (INDIVIDUAL):

1. Have the child make a pattern of *three* beads of *one* kind followed by *three* beads of another kind, etc.

## TOOTHPICKS OR MATCHSTICKS:

1. Give the child *six or seven* squares of paper and several toothpicks. *Three* toothpicks are to be arranged on each square - but in different ways.

## TILES:

1. Wooden or ceramic or heavy cardboard square tiles are given to the child in the given number, *three* in this example. The child arranges these in as many different ways as possible. Large graph paper and crayons enable the child to record each arrangement by coloring in squares to show the arrangement made.

## ANY COUNTABLES: Bottle caps, buttons, etc.

1. Have the children use *threes* to arrange on pieces of paper, stack, make a pattern or design. As the number grows, the possibilities for variations in how the objects of that number are arranged, patterned, linked into parts, etc. increases.

## PATTERN BLOCKS:

1. The child is given *three* Pattern Blocks to arrange in different ways. The results can be recorded using Pattern Block stickers or by tracing the arrangment and coloring the tracing.

## WOODEN CUBES:

1. Wooden cubes can be arranged on a plane or piled up into space. Each child is given *three* cubes to arrange however desired.

## LIMA BEANS, colored differently on the two sides:

1. These, like Unifix Cubes also give a part-part-whole model for the child. The child rolls out *three* beans and colors the bean form as the beans top faces appeared.

## TEACHER LED ACTIVITIES:

1. Use the overhead projector to give children an opportunity to see *threeness*. Put *three* objects on the overhead bed. Turn the projector on long enough for a visual image to be created by the child. Turn it off and have the child identify the number of objects seen. This can be done also by punching holes in different numbers on cards, labelling them with letters, and have the children ask for cards A, B, C, D, E., etc. to be shown.

2. Children are given several objects and a workspace sheet of paper or cardboard.

*"Put one three on your workspace."*

*"Put three ones on your workspace."*

*"Put two groups of three on your workspace.*

*"Put four "threes" on your workspace, etc.*

3. Give each child a link of *twelve* Unifix Cubes.

*"Break off a link of three cubes."*

*"Break off another link of three cubes."*

*"Break off another link of three cubes."*

*"How many links of three do you have?"*

Extension: Develop as many of the numbers in sequence as you can, using basically the same kinds of activities. When a child masters "three" go on to "four." When "four" is mastered, go on to "five", etc. This lesson is written for "three" as an example.

## NUMBER CONCEPT 8: NUMBER STORIES

**Introduction**: Much time should be spent talking about mathematics, in this case, number. Wherever possible use correct language associated with number and the words used with number.

**Activities:**

1. Have number days.
   "Today we shall talk about 'three'." "Can someone give me a story about three?" Have each child give a story involving three. Do this for each number as the children develop understanding of that number.

2. Make numeral cards.
   Children can have objects - Treasure Chest items, UNIFIX cubes, etc. Hold up a numeral card. Children are to hold up that many objects.

3. Give numeral cards to children.
   You show a number of objects on the overhead projector and children hold up the corresponding numeral.

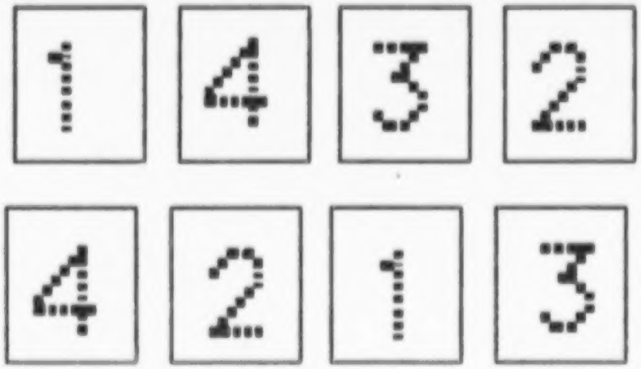
4. Make a post board number chart.
   Children are to put objects in the squares to match the numerals.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | ● | | | | | | | |
| 2 | ● | ● | etc. | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | | | | | | | | |

5. When children are building with blocks or using crayons, etc.,

have them count what is used.

6. Play "Concentration" with numeral cards in pairs arranged randomly upside down in an array. An example is shown for numerals 1, 2, 3 and 4:



Children are to take turns. A child turns over one card and leaves it in place. The child turns over a second card. If it matches the first, these are removed from play. If not, they are turned face down again and the turn goes to the next child. More than two cards with a given numeral can be used. Gradually extend to larger arrays to push identification of more numerals.

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## NUMBER CONCEPT 9 : WRITING NUMERALS

Background: Children should learn to write all numerals during kindergarten. This is best done by first writing numeral with large muscles and large movements and gradually moving to hand and finger muscles and movements.

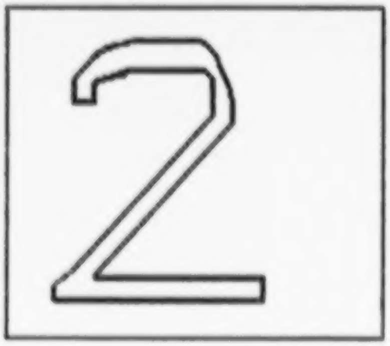
LESSON: On large (2' x 3' or so) pieces of tagboard, railroad board or heavy wrapping paper, print the numerals 0,1....9, so they are very large. Hang one numeral board at the front of the room. Have the children stand at a distance from the chart and *trace* the numeral with hand and arm. Do this for all numerals.

Follow-Up: Individually have children gradually move closer to the chart while tracing the numeral. When they get next to it they can trace the numeral with the forefinger. When all children have *internalized* this large motor tracjng, move to having them use fingers, crayons, large pencils to trace outlines of the numerals, dot patterns of the numerals, etc. Some suggestions are:

1. Trace numerals in soft clay
2. Trace numerals in wet sand
3. Trace numerals in dough and bake
4. Trace numerals made of sandpaper
5. Complete dot patterns of numerals (see Mathematics Their Way black line masters)

6. Practice writing numerals on lap chalkboards.
7. Have children "write" numerals on each other's backs with their forefingers. The one who is the "blackboard" must identify the numeral.
8. Trace numerals cut out of heavy cardboard.

Trace the opening, others trace the numeral cut out:



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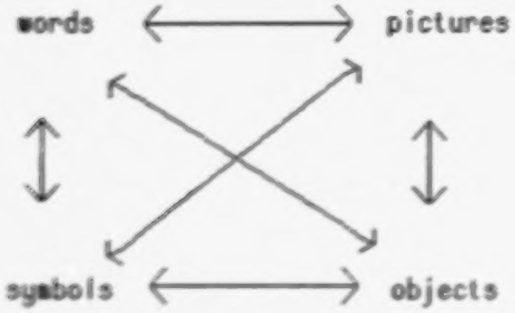
## NUMBER 10: CONNECTING SYMBOLS TO NUMBER

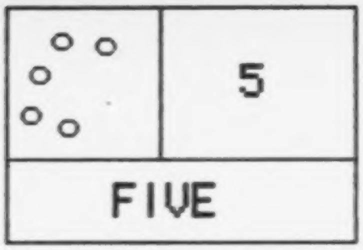
Background: Once children can identify the numerals and write them, these must be connected in the child's thinking to the numbers that they represent. This takes time, and requires many repetitions of the connecting experience. The process involves four aspects - oral, pictorial, symbolic and concrete.

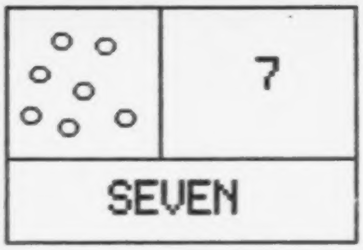


collections. They must also be able to write and identify symbols that relate to words, pictures and objects. By recording in pictures or graphs the results of their use of objects, they better internalize concepts and become able to re-create in their thinking experiences with objects. By arranging groups of objects in response to spoken or written word stimuli, symbol stimuli and pictorial stimuli, they demonstrate understanding of the meaning of these. They should be able to orally describe what is in pictures or collections of objects before written symbols are available to them.

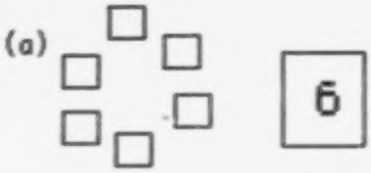
Described below are several activities to help the child develop understanding of numeral use.

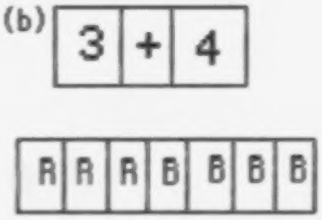
1. Prepare cards that look like those below for each number 0-9. Use these as a "flash card" activity with individual students or small groups of students.



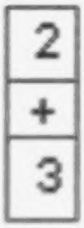


2. Prepare numeral cards with all numerals 0-9 and some with +symbols. Have children (a) place these next to collections of objects of a given number(s), arrange them to show the size(s) of the parts of a part-part-whole representation such as a two color Unifix cube link, (c) place on each card beans of that number, or (d) arrange to show the parts when a small handful of beans painted on one side are rolled out.

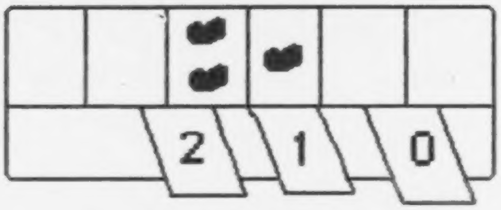




3. Use *Peek Through the Wall"* lesson on p. 180 of Mathematics Their Way.



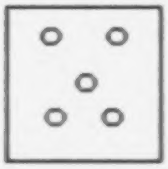
4. Use egg cartons with numbers of beans in order in the cells. Have the children place the numeral cards against the side by the cell with that number of beans.



5. Use the *"Lift the Bowl"* activity on p. 181 of Mathematics Their Way.

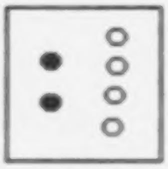
6. Have the children keep "notebooks" for each number. They can put pictures, drawings they make, records they make of work with materials and related things in these.

7. When children seem to be able to place numeral and + cards and have learned how to write the numerals, have them write number phrases to show pqrt-part-whole relations and the cardinality of collections shown them, overhead transparencies:



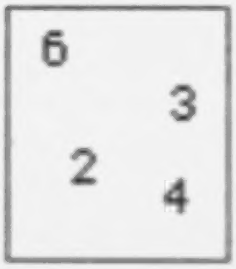
holes cut in a card and placed on the overhead

grouped material on the overhead



etc.

6. Put numerals in no special order on the overhead projector:



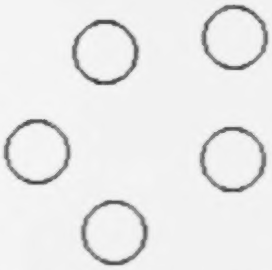
Ask the children to read them in the correct order from smallest to largest.

## NUMBER CONCEPT 11: INVARIANCE

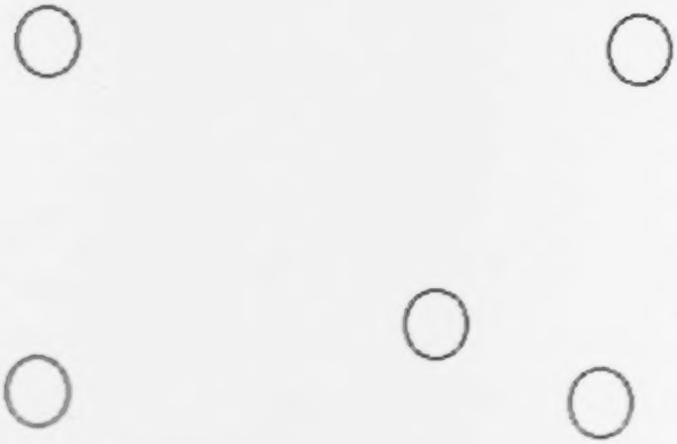
Background: Children must realize the number property of a collection remains invariant under any physical rearrangement of its parts - that only adding something to or taking something away changes the number property.

Introduction: On the overhead projector or flannelboard, place five or six counters in a line:

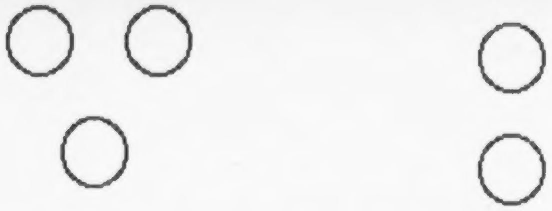
Ask the children to tell you how many are there. Rearrange these as shown:



Again ask the children how many are there. Rearrange as:



Again, ask if there are still five there. Rearrange as:



Again, ask if five counters are still on the board or projector. Then ask what you must do so there would be (LESS THAN) five there. Follow by making it MORE THAN five.

LESSON: Give children four of something: blocks, counters, toothpicks, etc., and ask them to arrange these on a piece of black construction paper in some arrangement. Check all students. Then ask them to arrange these a different way on the paper and check. Repeat with other numbers the children can count or otherwise recognize.

NUMBER: EXTRAS

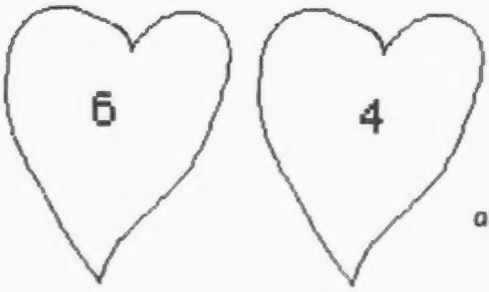
1. If possible, set up number stations for independent work by children. Each number station should have a particular material - Unifix cubes, beans, Pattern Blocks, etc. You will have to model for the children how to use these stations. While doing this ask questions of the children like those they should ask themselves. For example, when showing how to use Unifix Cubes for part-whole relations:

"Have you found ALL of the ways to link 3 green and 2 white Unifix Cubes?"

or arranging tiles: "Can you find still another way to put these 4 tiles into a pattern?"

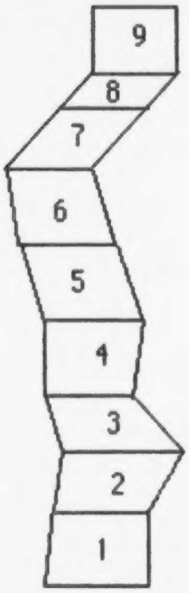
or making Geoboard patterns: "What row of the Geoboard has the most squares?"

2. Make numeral cards in the shapes related to seasons, i.e.



around Valentine's Day

3. A counting-walking mat to put on the floor



Have the children count starting at the "1" end and back starting at the "9" end.

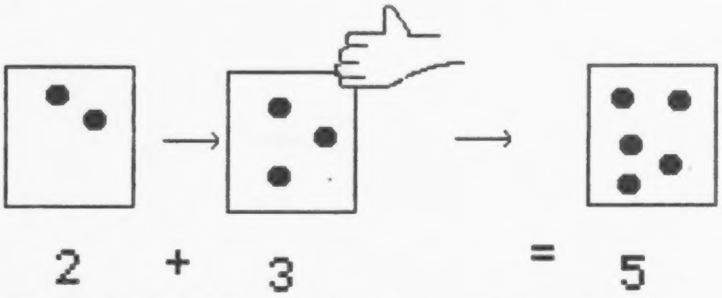
or large cut out numerals to step on and count aloud.

# KINDERGARTEN

## ARITHMETIC OPERATIONS 1: JOINING

Background: After children have mastered rational counting, can recognize numerosity of a collection, and can place numeral and + cards accurately, they should begin having experiences that underly the arithmetic operations. These are JOINING, SEPARATING and COMPARING. When applied to equal and unequal size groups of objects, these result in adding, subtracting, multiplying and dividing.

Introduction: Place two cubes or beans on the overhead projector. Have the children identify how many you have there: Write "2" on the board. Show them three or four more in your hand. Ask the children if you put these on the overhead if there would be more there or fewer. Point out that "+" shows that the end result will be larger or more. Write "+" after the "2" on the board. Place those from your hand on the overhead and write "3" after the "+".



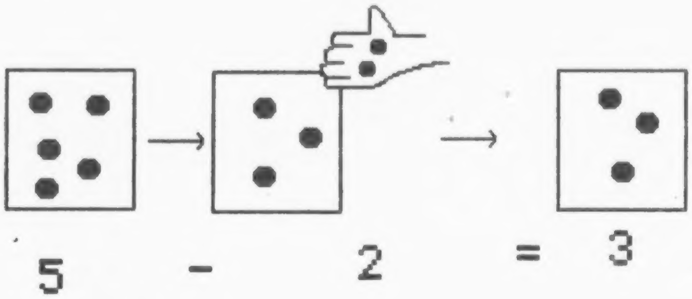
Now ask the children what the number of cubes is. "Is this more than we started with?" "How much more?" "How many cubes did we add to those we started with?"

LESSON: Children should have ten to fifteen Unifix cubes. Ask them to make a link of two cubes. When each shows you a correct link, ask each child to make a link of three cubes, and show you that. Then have them join these into a single link and identify how many cubes are in that link. Relate this to what you did on the overhead. Continue this with different starting numbers and numbers to be joined.

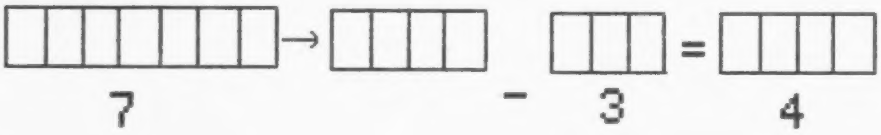
Extension: AFTER INTRODUCING THE EQUAL SIGN, "=" to show how two different names for the same number are linked, have the children write number sentences for each joining done.

## ARITHMETIC OPERATIONS 2: SEPARATING

Introduction: Place several counters on the overhead projector or on a flannel board. Ask the children to count how many are there. Write that numeral on the blackboard. Remove part of these and hold them in your hand. Write a "-" after the numeral. Explain that this sign is used when we are making a group of things smaller by taking some away.Then remove a small number of counters. Ask the children how many you removed. Write that numeral, then "=". Ask the children how many are left and write that numeral to complete the number sentence



Repeat this with a Unifix Cube link. Show the children the link and ask them how many cubes there are. Write that numeral. Then break away a link and ask what sign shows this. Write that sign. Then show them the link removed and write that numeral followed by the "=" sign. Ask them how many cubes are in the link now and write that numeral.

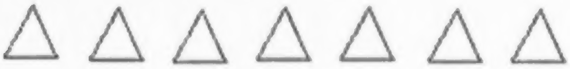


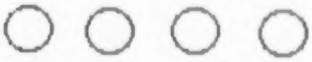
LESSON: Give the children Unifix Cubes. Have them make links, break off links from these and write number sentences to show this. Move around and monitor what they are doing, reinforcing the meaning of the symbols - numerals, "-" and "=" - whenever necessary. Repeat this association of "-" with making the original smaller by "taking away" as often as needed. Use Unifix Cubes, beans, and other objects.

## ARITHMETIC OPERATIONS 3: COMPARING

Background: This is probably the first operation children use involving number. "You have two more cookies than I have," "If I had three more, I'd have as many as you have," are commonly heard when two or more children are working with countable objects. This natural thinking process needs to be related with the symbols used to show the results of making comparisons.

Introduction: On the overhead projector or the flannel board place two sets of objects of unequal numbers:

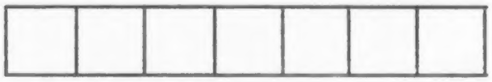


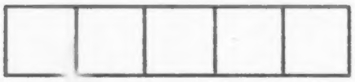


Ask the children which row has MORE? How many MORE? How many would have to be ADDED to the shorter row to have AS MANY AS in the longer row?

Repeat this with rows of different size.

Make up two links of Unifix Cubes of different length:





Ask several questions about these such as "How many would I have to break off the longer one so it would have as many cubes as the shorter? How many cubes more are in the longer one? The shorter one has how many fewer cubes than the longer?

Children should have frequent exposure to expressions such as "more than," "fewer than," "as many as," "less than," "added to," "taken away from," etc. as these relate to joining, separating and comparing.

LESSON: Prepare containers with 5-8 of each of three different color Unifix Cubes - but in unequal numbers. An example might be 5 reds, 7 blues and 8 whites.

Have each child dump out the cubes and count ALL cubes. Then have them sort them by color. Then have them link together those of the same color. Have each child order the links. Ask the children to state how many cubes are in the LONGEST link. Then ask each child what other child has a longest link of the SAME NUMBER. Ask the group who would have to have 3 MORE cubes in the shortest link so it would be the SAME AS the longest. Ask other comparison questions about these links.

Extensions:
1. Have groups of children make Unifix cube lengths to match various short lengths in the room - desk edges, book lengths, etc. Then have these ordered and compared. "The desk edge is how many cubes longer than the book edge?" etc.

2. Using numbers compare favorites of the children:

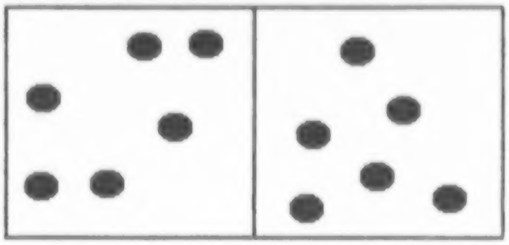
(a) pets (b) colors (c) drinks (d) foods (3) TV shows, etc.

3. Have graphs made of (a) birthdays (b) sunshine days (c) tooth losses in a week or month, etc. Use these to compare outcomes using number where the questions focus on adding to or taking away from to make equal (EQUALIZING).

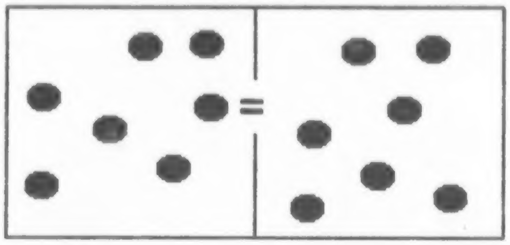
## EQUALITY: THE CONCEPT

Background: Children must learn what equality means early so that they never develop the idea it is a signal that indicates "the answer" comes next. This concept of equality is too common in children in later years.

Introduction: On the overhead or flannel board place six objects well to one side and six well to the other side. On the overhead you can use a transparency "split board" as shown:

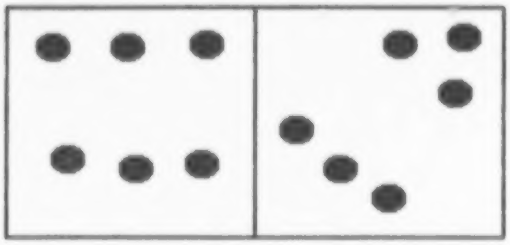


Ask the children how many are on one side of the line. Point to the side with your finger, then ask how many are on the other side. Write the "=" sign as shown:



Tell the children this sign shows there are as many on one side of it as on the other side and cannot be used if that is not so. Erase the sign. Take one object from one side. Ask the children if you can write the sign now. If you need to, re-create the "equals" situation and disturb it in different ways until it seems the children know when it can be used.

Group one side as shown:



Ask the children if you can write the "=" sign on the dividing line. Group the sides in different ways and each time ask the children whether the sign can be written. Ask when one side would not be equal to the other. See if you can elicit the idea that they will stay equal unless you take something away from one side or add something to one side.

LESSON: Make "split boards" for each child. Give them Unifix Cubes and ask them to place them so one side "equals" the other. Have them show you when each equality is created. Repeat this activity until most identify "=" as meaning as many on one side as on the other.

## GEOMETRY

Background: By working with Pattern Blocks and Geoblocks, children will have experiences with geometric ideas. They can begin to recognize when edges are equal, when angles are equal, when different shapes occupy equal areas, etc. They will realize that plane shapes like squares, triangles, rectangles are found on 3 dimensional objects, and are not pictures on paper. Some suggested activities for these materials follow:

Geoblocks:

1. Sort them by shapes found on faces.
2. Order them.
3. Find all triangles on them.
4. Find all squares on them.
5. Find all rectangles on them.
6. Build from them - castles, forts, ramps, filling stations garages, etc.
7. Trace their faces on paper and compare these.
8. Try to fit two smaller blocks together to make on of the larger blocks.
9. Have children copy structures you have made from 2,3 or 4 of the blocks.
10. How are 2 given blocks ALIKE? How DIFFERENT?

Pattern Blocks

1. Have children fill in prepared outlines that show where the Pattern Blocks should be placed.
2. Have children fill in simple outline, where only the outline is given.
3. Have children copy patterns that you have made with the Pattern Blocks.
4. With a given small number of Pattern Blocks, have them create as many different shapes as they can by combining them.
5. Use the sheets provided for 1 & 2 .

Create others.

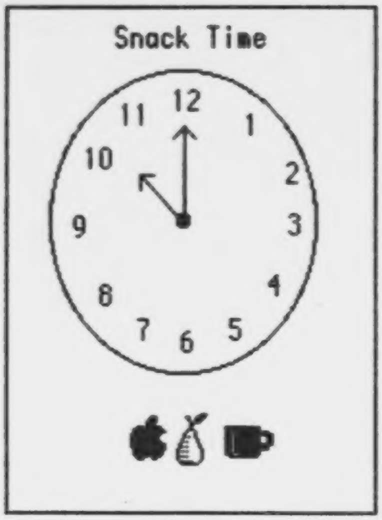
Use Pattern Block Problems for Primary People and Pattern Animals.

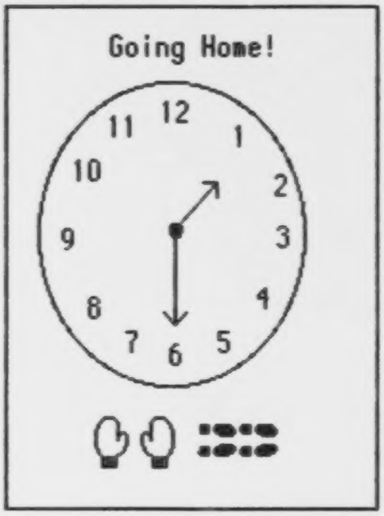
## TIME: READING CLOCKS

Introduction: Although there are numerals on the face of a circular clock and on the readout of a digital clock, time is a physical and social concept, not a mathematical concept. Children should learn to judge intervals of time, estimate lapses of time and future durations of time. This can be done in several ways:

1. In oral counting activity, it takes longer to count to ten than to five, for example. Have children estimate the time it takes to count to different ending numbers - as long, twice as long, etc.

2. Use clock charts for recurrent events:





3. Use the calendar and maintain a daily chart:

M A Y

| S | M | T | W | TH | F | S |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | 31 | | | | |

REPLACEABLES

TODAY IS TUESDAY

THE MONTH IS M A Y

THE DAY IS 10

Refer to the calendar frequently vis a vis student's birthdays, special events, etc.

At the end of a month, cut up the calendar and give the numbers to children for special reasons - a birthday, lost a tooth, had a stomach ache, didn't cry, etc.

Point to numerals on the calendar and ask children to identify them.

4. Use a metronome to time events.

5. Use clocks made of paper plates, brass fasteners and cardboard "hands". Have children set these to particular times, e.g. "lunch time," "10 minutes past twelve," etc.

## KINDERGARTEN

### MONEY

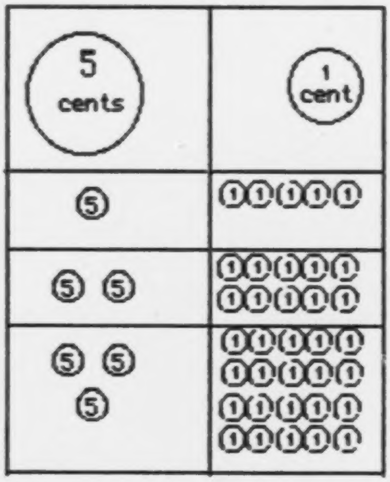
Introduction: Use of money involves number, counting and the very abstract concept of exchanging a unit of one value for a unit of a different value. Hence money activity should proceed developmentally during the year and be integrated into other focuses such as counting and number concept.

Use either real money or plastic coin simulations. Introduce the coins in the following sequence:

Pennies:
1. Count them
2. Estimate the number needed for lost cost items selected from store ads, displays, etc.
3. Use them to balance and weigh things
4. Use them for correspondence activities
5. Join them to find new amounts
6. Compare groups of them
7. Decrease a group of them one at a time

Nickels:
1. Do the same kind of activities as you do with pennies
2. Exchanging pennies for a nickel or interpreting the value of a nickel as equivalent to the value of five pennies is an abstract concept.

Make correspondences of pennies and nickels on the overhead projector:

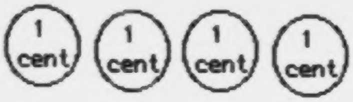


Point out that FIVE pennies can be exchanged for ONE nickel.

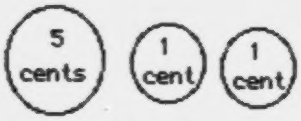
3. Introduce the idea of a TOTAL value in cents of a combination of nickels and pennies gradually. Use an overhead transparency chart:

| | |
|---|---|
| | |

Put combinations such as the following on the chart and ask the children for TOTAL VALUE in CENTS, e.g.

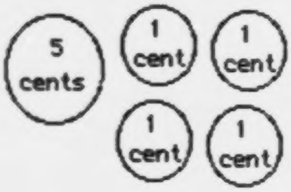

1 cent
1 cent
1 cent
1 cent

FOUR CENTS


5 cents
1 cent
1 cent

SEVEN CENTS

(Have the children count on the pennies starting with FIVE CENTS for the nickel)


5 cents
1 cent
1 cent
1 cent
1 cent

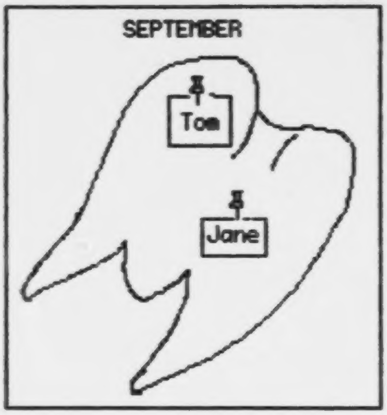
Don't use more than one nickel for this.

## KINDERGARTEN

### GRAPHING

Introduction: Children can be introduced to bar type graphs at this level by using pictures, stamps, etc. Some examples of graphs to be developed over differing periods of time include:

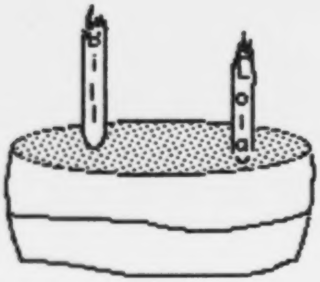
1. Tooth Graphs: Two kinds of graphs can be developed here. One involves pictures of a large tooth on which names of children are pinned. One tooth is used each month. Upon completion of the month, the tooth graph data is transferred to a summary graph:

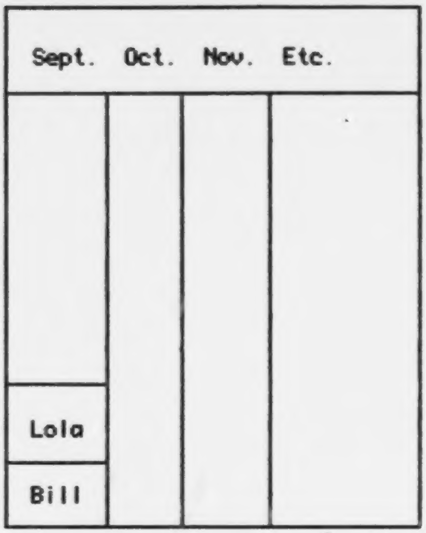


| TEETH LOST | | | | |
|---|---|---|---|---|
| SEPT. | OCT. | NOV. | DEC. | ETC. |
| TOM | | | | |
| JANE | | | | |

Toward the end of the year, this graph can be used to compare. "In which month did the most children lose teeth?", etc.

2. Birthday Graphs. A birthday cake is made for each month and "Summer". Candles are used to write children's names:





Translate to a summary graph as with Lost Teeth.

3. Other ways to develop bar graphs:

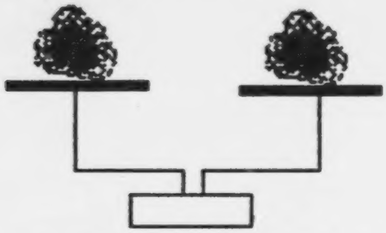
   Favorites: pets, colors, snacks, TV shows, etc.
   Apparel: colors of socks, shoes, shirts, etc.
   Kinds of cars: Fords, Chevys, etc.

## KINDERGARTEN

## BALANCE ACTIVITIES

Introduction: Children can have experiences with balances that will help them conserve weight. Use both pan balances and OHAUS balances that have hoppers.

LESSON ONE: Use plasticene or play dough lumps. Make them so that they balance the scale:



Flatten one of them into a pancake. Ask the children if it will still balance the other one. This could generate some discussion. Finally, place it on the pan and show that they still balance.

LESSON TWO: Put 6 washers (or UNIFIX, pennies, paper clips or other "standard" weights) on each hopper or on each pan, of a balance. Get the children to see the sides balance. Hold up another washer (etc.) over one pan or hopper. Ask the children if that side would go up or down if you put that one with the others on that side. Discuss the situation.

LESSON THREE: Put 3 washers on one side and 5 washers on the other side. The balance will tip toward the 5 washers. Ask the children how many washers you would have to put on the other side so it will balance.

Extensions: Select pairs of small objects available in the room. Ask the children to estimate which will make the balance tip down when both are placed on the balance.

# SONGS AND VERSES

# FOR KINDERGARTEN

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My Hands .......... Pg. 14
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### Nursery Rhymes:

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# SONGS

**Coming to School**

Look! Here you see little Topsy Tool
She has worn her yellow hat to school
Look! Here you see little Robert Rule
He has brought his crimson train to school.

**Three Balls**

A little ball, a bigger ball, a great big ball I see!
Now let us count the balls, one, two, three.

**Pointing**

Left to the window, right to the door
Up to the ceiling, down to the floor.

**Traffic**

Look to the right and look to the left, when you cross on the busy street
Cars and bicycles, buses and vans, any of these, you may meet.

**My Hands I Place**

On my head my hands I place, on my shoulders, on my face,
On my hips and at my side, then behind me they will hide
I will hold them up so high, make my fingers quickly fly
Hold them out in front of me, swiftly clap, one, two, three.

**Five Little Pigs**

This little pig went to market
This little pig stayed at home
This little pig had roast beef
This little pig had none
And this little pig said
"Wee, wee, wee, wee, wee", all the way home.

**Pease Porridge Hot**

Pease porridge hot
Pease porridge cold
Pease porridge in the pot
Nine days old.

Some like it hot
Some like it cold
Some like it in the pot
Nine days old.

## Old Mother Hubbard

Old Mother Hubbard, she went to the cupboard,
 to get her poor dog a bone
When she got there, the cupboard was bare,
 and so the poor dog had none.

## My Van

My van is ready to drive away, and here's the load I must take today
(Five) big sacks of corn you see
Who'll come and load my van for me?

## Fa-La-La

Number One, Number One,
Gaily round the room I run
*Refrain:* With a fa-la-la-la-la-la

Number Two, Number Two,
May I come and dance with you?
*Refrain*

Number Three, Number Three,
Will you please make room for me?
*Refrain*

Number Four, Number Four
I will make just one more.
*Refrain*

Number Five, Number Five,
We are glad to be alive.
*Refrain*

Number Six, Number Six,
See how I can do high kicks.
*Refrain*

Number Seven, Number Seven,
Pack your bags and come to Devon.
*Refrain*

Number Eight, Number Eight
Hurry up or you'll be late.
*Refrain*

Number Nine, Number Nine,
See us puffing down the line
*Refrain*

Number Ten, Number Ten,
Now we're coming back again.
*Refrain*

## Here I Come

Here I come, Number One, like a zebra I can run. *One*
Here I come, Number Two, jumping like a kangaroo. *One, two*
Here I come, Number Three, climbing like a chimpanzee. *One, two, three*
Here I come, Number Four, like a lion I can roar *One, two, three, four*
Here I come, Number Five, like a sea-lion I can dive *One, two , three,.......*
Here I come, Number Six, like a monkey playing tricks *One, two,............*
Six, five, four, three, two, one, to our cages we will run.

### Two Little Eyes

Two little eyes that open and close; two little ears and one little nose
Two little cheeks and one little chin; two little lips with the teeth
closed in.

### See my Fingers

See my fingers merrily dancing. Now they make a window frame
I peep through it and I see two little fingers wave to me.

### How Many Fingers?

On my right hand what do I see?
Five little fingers all looking at me.
On my left hand what do I see?
Five more fingers all looking at me.
I put them together, then I see
Ten little fingers all looking at me.

### How Do You Do?

Five little boys met five little girls; bowed and said, "How do you do?
Come and play with us today! You hide first and we'll seek you."

### Counting to Nine

One, two, three, do you see me?
Four five six, picking up sticks.
Sev'n, eight, nine, tying them with twine. Won't they make a fire so fine."

### This Old Man

This old man, he played one
He played nick-nack on my drum
Nick-nack paddy whack, give a dog a bone
This old man came rolling home.

This old man, he played two
He played nick-nack on my shoe
Nick-nack, etc.

This old man, he played three
He played nick-nack on my tree
Nick-nack, etc.

This old man, he played four
He played nick-nack on my door
Nick-nack, etc.

This old man, he played five
He played nick-nack on my hive
Nick-nack, etc.

This old man, he played six
He played nick-nack on my sticks
Nick-nack, etc.

This old man, he played seven
He played nick-nack down in Devon
Nick-nack, etc.

This old man, he played eight
He played nick-nack on my gate
Nick-nack, etc.

This old man, he played nine
He played nick-nack on my line
Nick-nack, etc.

This old man, he played ten
He played nick-nack on my hen
Nick-nack, etc.

### The Clock
When at seven the clocks all chime
Then I say, "Getting-up time!"

Hark! The clock is striking eight
Breakfast's ready, don't be late.

Hark! The clock is striking ten
Now we are at work again.

There's eleven striking clear
Out we go, for play-time's here.

When at twelve the clocks all chime
Then we know it's near lunch-time.

Hark! The clock is striking one
In the playground we can run.

Hark! The clock is striking two
Back in school with work to do!

Hark! The clock is striking three
Friends walk home and play with me
*Or: Mother will come and call for me.*

Hark! The clock is striking four
Now we're back at home once more.

Five o'clock, it's time for tea
I hope there's jam and cake for me!

Six o'clock the clocks all say
We must have a bath today.

Seven o'clock, the day has fled
All good children go to bed.

### How Many Steps?

How many steps do I have to take, to get from here to the door?
Please count how may steps I take, walking across the floor.

### Ten Little Mice

One little mouse as quiet as can be
along comes another one, says "Come and play with me."
Two little mice scampering to and fro
along comes another one, says, "Come, let's go."
Three little mice now creeping 'cross the floor
along comes another one, says, "Let's go out the door."
Four little mice they're having lots of fun
along comes another one, and off they all run.
Five little mice hid right behind the mat
along comes another one, says, "Here comes the cat."
Six little mice have such a dreadful scare
along comes another one, says, "Hide behind the door."
Seven little mice as tired as can be
along comes another one, says, "Time for tea."
Eight little mice are eating bits of cheese
along comes another one, says, "May I have some, please?"
Nine little mice are playing in the shed
along comes another one, says, "Ho, it's time for bed."
Ten little mice now to their wee nest creep
say, "Goodnight to every one," and soon they're fast asleep.

### Bumble Bees

One busy bumble bee, round and round does buzz
Flying to the butter cups, buzz, buzz, buzz
Two busy bumble bees, round and round they buzz,
Flying to the buttercups, buzz, buzz, buzz
Three busy bumble bees,......etc.

### One, Two, Three

Over in the meadow in the sand in the sun
Lived an old mother toadie and her little toadie one
"Hop," said the mother
"I hop" said the one
So he hopped and was glad in the sand in the sun

Over in the meadow where the stream runs blue
Lived an old mother fishey and her little fishies two
"Swim," said the mother
"We swim" said the two
So they swam and they leaped where the stream runs blue.

Over in the meadow in the nest in the tree
Lived an old mother birdie and her little birdies three
"Sing," said the mother
"We sing," said the three
So they sang and were glad in the nest in the tree.

### Little Teddy Bears

Four little Teddy Bears, standing in a line
Each in his furry coat looking very fine
Now they make a ring and gaily dance around
Now they make a bow right to the ground.

Four little Teddy Bears, playing in the sun
Up comes a crocodile, away runs one
Only three are left - just count them and you'll see
Jolly little Teddy Bears, one, two, three.

Three little Teddy Bears, walking through the zoo
A wild bear hugged one and that left two
Two were going along, as fast as they could run
Up came a tiger - he ate one.

Poor little Teddy Bear what a time he's had
All of his friends are gone so he's very sad
With his furry paws, he wipes his little eyes
Sitting all alone, he sadly cries.

Up comes Father Bear, says, "Get up my son,
If Mr. Lion comes, he must not find one -
Come along with me and we will have some fun."
Off he went with Dad - and that left none.

### Five Little Aeroplanes

Five little aeroplanes ready to roar
One flew up in the sky, then there were four.
Four little aeroplanes stood near to me
One flew up in the sky and then there were three.
Three little aeroplanes all coloured blue
One flew up in the sky, then there were two.
Two little aeroplanes out in the sun
One flew up in the sky and then there was one.
One little aeroplane ready to run
He flew up in the sky and then there was none.

### Ten Little Puppies

Ten little puppies in the sunshine
one wen into his box then there were nine.
Nine little puppies ran at such a rate
one fell into a ditch then there were eight.
Eight little puppies flying up to heaven
one had to bail out then there were seven.
Seven little puppies building with their bricks
one lay down and went to sleep, then there were six.
Six little puppies learning how to dive,
the water was too cold for one, then there were five.
Five little puppies had some bones to gnaw
one ran off and buried his, then there were four.
Four little puppies barking noisily
one made his throat sore and then there were three.
Three little puppies wondering what to do
one went to chase a cat, then there were two.
Two little puppies having lots of fun
one ran away, and then there was one.
One little puppy left all alone
he ran off to find his friend, then there were none.

### The Ring

We'll make a ring and all hold hands and show what we can do
We'll jump and clap and jump again, can you and you and you?
The first shall jump, the second clap, the third shall jump again -
A jump, a clap, a jump, a jump, a jump.

### Twelve Days of Christmas

On the first day of Christmas
my true love sent to me
A partridge in a pear tree.

On the second day of Christmas
my true love sent to me
Two turtle doves
And a partridge in a pear tree.

On the third day of Christmas
my true love sent to me
Three French hens
Two turtle doves
And a partridge in a pear tree.
On the fourth day of Christmas
my true love sent to me
Four calling birds
Three French hens
Two turtle doves
And a partridge in a pear tree.

On the fifth day of Christmas
my true love sent to me
Five gold rings
Four calling birds.....

On the sixth day of Christmas....
Six geese a-laying, five gold rings....

On the seventh day.....
Seven swans a-swimming, six geese a-laying.....

On the eighth day.....
Eight maids a-milking, seven swans a-swimming......

On the ninth day......
Nine ladies dancing, eight maids a-milking......

On the tenth day.....
Ten lords a-leaping, nine ladies dancing....

On the eleventh day......
Eleven pipers piping, ten lords a-leaping.....

On the twelfth day.......
Twelve drummers drumming, eleven pipers piping.......

Ten Little Pixies
Two little pixies sitting on a wall
  along came another two, say, "Let's play ball."
*Refrain: Run to the hilltop, run to the tree, run little pixies*
    *as quickly as can be.*
Four little pixies sitting in the sun
  along came another two, say, "Let's have some fun."
*Refrain*
Six little pixies climbing up a tree
  along came another two, say, 'Let's go for tea."
*Refrain*
Eight little pixies resting on a gate
  along came another two, say, "Quick, you'll be late."
*Refrain*
Ten little pixies say, "No more we'll roam,"
  so off they hurry down the road - soon they're at home.
*Refrain*

Ten Little Goblins
Ten little goblins dancing in the glen
Frightening the fairies - naughty little men
Here comes the Fairy Queen, a magic wand has she
Ev'ry one she touches will turn into a tree
Ten little goblins dancing in the glen
But two are turned to oak trees -naughty little men.

Lighting Lamps - for class (C) and lamplighter (L)
C: The road is dark for the sun has set. Not one of the lamps is lighted yet.
L: I have come the lamps to light. Two tall lamps are shining bright.

C: The road is dark for the sun has set, And 8 tall lamps are not lighted yet
L: I have come the lamps to light, 2 more lamps are shining bright.

C: The road is dark for the sun has set, and 6 tall lamps are not lighted yet
L: I have come the lamps to light, 2 more lamps are shining bright.

C: The road is dark for the sun has set, and 4 tall lamps are not lighted yet
L: I have come the lamps to light, 2 more lamps are shining bright.

C: The road is dark for the sun has set, and 2 tall lamps are not lighted yet.
L: I have come the lamps to light. The last 2 lamps are shining bright.

C: The road was dark, but now it's light-for 10 tall lamps are shining bright!

## VERSES

### I Can

I can hop on one foot
And also jump on two
I swing my left around about
And wave my right to you.

I move my head from side to side
And from my waist bow low
I bend my knees right down to the ground
As far as they will go.

I sit and droop my shoulders
And make myself feel small
But when I stretch and stand up straight
I look so very tall.

### Big and Small

We're dancing in a big ring
And round and round we go
Sometimes we dance so very fast
And then we are quite slow.

We're dancing in a small ring
And round and round we go
Sometimes we dance so very fast
And then we are quite slow.

### My Hands

My hands are on my shoulders, and now they're on my head
I'll put them on my two small ears
And on my cheeks so red.

Now I'll touch my two bright eyes, and then my nose I'll find
I'll touch my lips and touch my chin
My hands I'll hide behind

I'll touch my toes and then my knees, and then my nose I'll find
I'll start from the beginning
And touch them all again.

Shapes
Can you draw a square
Care-ful-ly?
Can you draw a square
Just for me?
The window pane is square I know
I can can draw a square just so.

Can you draw a circle
Care-ful-ly?
Can you draw a circle
Just for me?
A dinner plate is round I know
I can draw a circle, so.

Can you draw an oblong
Care-ful-ly?
Can you draw an oblong
Just for me?
Our door is oblong, that I know
I can draw an oblong, so.

Can you draw a diamond
Care-ful-ly?
Can you draw a diamond
Just for me?
There's a diamond on the card I know
I can draw a diamond, so.

Can you draw a triangle
Care-ful-ly?
Can you draw a triangle
Just for me?
There's a triangle in the band, I know - I can draw a triangle, so.

### Weights
Here's an ounce and here's a pound
Please don't drop them on the ground
An ounce will make but a tiny bump
But a pound would make a dreadful thump!

### Measuring How Tall
I measure three feet
Tom measures four
So Tom measures my feet
And one foot more.

### Baa Baa Black Sheep
Baa baa black sheep have you any wool?
Yes sir, yes sir, three bags full.
One for my master, one for the dame
And one for the little boy that lives down the lane.

### Old King Cole
Old King Cole was a merry old soul
And a merry old soul was he.
He called for his pipe and he called for his bowl
And he called for his fiddlers three.

Now every fiddler had a very fine fiddle
And a very find fiddle had he.
Oh, there's none so fair as can compare
With King Cole and his fiddlers three.

### Long Time Ago
Once there was a little kitty
White as the snow
In the barn she used to frolic
A long time ago.

In a barn a little mousie
Ran to and fro
For she spied the little kitty
A long time ago

Two black eyes had little kitty
Black as a sloe
And they spied the little mouse
A long time ago

Four soft paws had little kitty
Paws soft as dough
And they caught the little mousie
A long time ago.
Nine white teeth had little kitty,
All in a row
And they bit the little mousie
A long time ago.

When the teeth bit little mousie
Little mouse cried, "Oh!"
But she got away from kitty
A long time ago.

### See Me Come

See me come I'm Number One
Like a pony I will run.

See me come I'm Number Two
I can jump the way frogs do.

See me come I'm Number Three
I'll be a possum climbing a tree.

See me come I'm Number Four
Like a snake I wriggle on the floor.

See me come I'm Number Five
I'll be a penguin - waddle and dive.

See me come I'm Number Six
A circus seal, I'm doing tricks.

When we see our number card
We each run back to our cage in the yard.
Two, One, Six, Five, Three, Four
Now you can't see us any more!

### Number Cards

My card shows little Number One
March around, it is such fun!

My card shows little Number Two
You bend down and polish your shoe.

My card shows little Number Three
Twirl around so gracefully.

My card shows little Number Four
Walk like a bear with hands on the floor.

My card shows little Number Five
Buzz and fly like a bee from a hive.

My card shows little Number Six
Swing your arms as stiff as sticks.

Figure One So Straight and Tall
Figure One so straight and tall
Run and stand beside the wall.

Now it's your turn, Figure Two
Jump just like a kangaroo.

Figure Three, now you must hop
And by the window you must stop.

Next we come to Figure Four
You walk quickly to the door.

Figure Five, creep like a mouse
And stand beside the dollies' house.

And skipping lightly, Figure Six
Stand beside the box of bricks.

Two
Two little eyes watch what you do
Two little lips that smile at you
Two little ears to listen with a will
Two little hands hardly ever still
A tongue that speaks to you each day
A brain to think for work or play
Two feet that walk and skip and run
Used every day by everyone.
Two ears to hear, two eyes to see
Two hands to work and play for me
Two shoes to tie, two feet to walk

Two lips to help me when I talk
Two cheeks as red as any rose
Two holes to breathe in through my nose
Two arms for sleeves, two gloves I wear
Two legs for socks. Two means a pair.
Two little hands go, clap, clap, clap
Two little arms lie in my lap
Two little feet go bump, bump, bump
Two little legs give a great big jump
Two little eyes are shut up tight
Two little lips whisper low, "Good night."

### I Have Ten Tiny Fingers
I have ten tiny fingers
I have ten tiny toes
I have two eyes
I have two ears
I have one little nose.

### Six Rhyme
I'm number six, look well at me
Every six is a double three.

Half a dozen cherries, in three bright pairs
Half a dozen apples, six teddy bears.

Seagulls three with wings of white
Two, four, six, spread out for flight.

Six ten soldiers march in threes
Under the shade of six tall trees.

Hexagon's sides are always six
Let's make those sides with six matchsticks.

### Our Puppy
Our puppy has four little feet
One little mouth with which to eat
One little nose with which to smell
And two little ear as well
Two little eyes with which to see
Two bright eyes watch you and me.

### Numbers are Fun

Numbers are fun whatever they do
First there's one and then comes two
After two come three and four
Then comes five - now count once more.

One, two, three, four, five.

You count to five - that is fine
Number six is next in line
Then comes seven, eight, nine, ten
Now let's stop and count again.

One, two, three, four, five, six, seven, eight, nine, ten.

### One, One

One, one here I come
Two, two, what shall I do?
Three, three, I'll climb a tree
Four, four, I'll sit on the floor
Five, Five I'm much alive
Six, six, I'm chopping sticks
Seven, Seven, I'll drive to Devon
Eight, eight, I'll wash my plate
Nine, nine, I'll make my shoes shine
Ten, ten, I'll write with a pen.

### Puppies and Kittens

One puppy, two puppies, three puppies, four
Fast asleep on the kitchen floor
One meow, two meows, three meows, four
Woke the puppies on the floor
With on yap, two yaps, three yaps, four
They chased the kittens through the door.

### A Train

We'll make a train and go for a ride
Here are the carriages side by side
One, two, three, four, five
Six, seven, eight, nine, ten
SH,sh,sh - off we go -
Ten little carriages, all in a row.

### Ten Ducks
One duck, two ducks splashing in a pool
Three ducks, four ducks find the water cool
Five ducks, six ducks want to stay and play
Seven ducks, eight ducks love a rainy day
Nine ducks, ten ducks, all with wings outspread
Shake their glossy feathers and waddle off to bed.

### Four Robins
A robin sat high in a tree
singing oh so merrily
He sang and sang the sky was blue
another came and that was two.

Two robins sat high in a tree
singing oh so merrily
They sang and sang so loud and free
another came and that was three.

Three robins sat high in a tree
singing oh so merrily
They sang and sang and sang some more
another came and that was four

Four robins sang till day was through
and then off to their nests away they flew
They sang and sang and sang some more
one and two and three and four.

### Little Teddy Bears
I'm a little Teddy Bear
Dancing here, dancing there
All alone, I'm only one
Dancing, dancing, oh what fun.
I'm a little Teddy Bear
Dancing here, dancing there
One and one will make up two
Watch and see what they will do!
I'm a little Teddy Bear
Dancing here and dancing there
Two and one add up to three
Dance and dance around with glee.

One, two, three, they dance around

Now they sit upon the ground
One, two, three, so bright and gay
Dancing, dancing, all the day.

### A Visit To A Farm

One little dog, two little cats
Three farmer boys with shade hats
Four clucking hens, five fluffy chicks
Six little axes for chopping up sticks

Seven red tractors, eight heavy trucks
Nine of the farmer's best white ducks
Ten white lambs so cuddly and small
Yes, I liked the lambs best of all.

### Five Little Puppies

Five little puppies sitting by a tree
Tails swish left
Tails swish right
One saw a birdie and up jumped he.

Four little puppies sitting by a tree
Tails swish left
Tails swish right
One saw a birdie and up jumped he.

Three......,etc.

### Before a Birthday

Four more days I will awake
Then I'll eat my birthday case.

Three more days I will awake
Then I'll eat my birthday cake.

Two.....,etc.
One......,etc.

## Ten Fingers

Show me ten little soldiers standing up straight
Show me nine - show me eight
Show me seven little fingers lying on the table
Show me six-show me five, if you are able
Show me four little birds sitting on the roof
Show me three - show me two
Show me one little finger touching your head
Clap them all together and put them to bed.

## My Three Hens

Watch my three hens and you will see
They walk always one, two three
First the black one leads the line
Second the white one with feathers fine
Brownie follows last and she makes the third one you will see.

## Chickens

Two little chickens looking for some more
Along came another two and that made four
Run to the haystack, run to the pen
Run little chickens, run to Mother Hen.

Four little chickens scratching by some sticks
Along came another two and that made six
Run to the haystack, run to the pen
Run little chickens, run to Mother Hen.

Six little chickens, pecking by the gate
Along came another two and that made eight
Run to the haystack, run to the pen
Run little chickens, back to Mother Hen.

## Legs

One brown cow stands by a tree
Four brown legs I now can see.

One brown donkey stands by the cow
Eight brown legs I see there now.

Now a brown horse comes to make three
Twelve brown legs are there to see.

### Potatoes

Four potatoes for Mary
Put them on her plate
Four potatoes for Alan
Count them now - four, eight
Four potatoes for myself
Altogether - four, eight, twelve.

### Doubles

One and one are two.
(One for me and one for you.)

Two and two are four.
(If you like this, let's do more.)

Three and three are six.
(That's as easy as picking up sticks.)

Four and four are eight.
(It's not too hard to get that straight.)

Five and five are ten.
Now let's do it all again!